

P. ENT COOPERATION TREA.

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

AS BERGEN PATENTKONTOR
P.O. Box 1998, Nordnes
N-5817 Bergen
NORVÈGE

Date of mailing (day/month/year) 17 April 2001 (17.04.01)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference JOO/iek	
International application No. PCT/NO00/00017	International filing date (day/month/year) 26 January 2000 (26.01.00)

1. The following indications appeared on record concerning:

☐ the applicant ☐ the inventor ☒ the agent ☐ the common representative

Name and Address AS BERGEN PATENTKONTOR C. Sundtsgt. 36 N-5004 Bergen Norway	State of Nationality	State of Residence
	Telephone No. 47 55 21 53 53	
	Facsimile No. 47 55 21 53 50	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☐ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address AS BERGEN PATENTKONTOR P.O. Box 1998, Nordnes N-5817 Bergen Norway	State of Nationality	State of Residence
	Telephone No. 47 55 21 53 53	
	Facsimile No. 47 55 21 53 50	
	Teleprinter No.	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer C. Cupello Telephone No.: (41-22) 338.83.38
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INTERNATIONAL COOPERATION TREATY

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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
 United States Patent and Trademark
 Office
 Box PCT
 Washington, D.C.20231
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 04 October 2000 (04.10.00)	
International application No. PCT/NO00/00017	Applicant's or agent's file reference JOO/iek
International filing date (day/month/year) 26 January 2000 (26.01.00)	Priority date (day/month/year) 28 January 1999 (28.01.99)
Applicant HJERTHOLM, Ole	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
25 August 2000 (25.08.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Manu Berrod Telephone No.: (41-22) 338.83.38
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JC18 Rec'd PCT/PTO 20 JUL 2001

REPLACED BY
ART 34 AMOTSealing Arrangement

Present invention relates to a sealing arrangement comprising two armature members, which are adapted to receive a sealing ring between them for sealing off a joint between the armature members, and a clamping device, which during mounting is adapted to clamp the armature members against each other in a direction towards the intermediate sealing ring, where the sealing ring has a substantially T - shaped annular cross-section, with a stem extending radially outwards and with a seal face facing radially outwards in each of two sealing wings projecting axially outwards in opposite directions from the stem of the T - shape, and where the sealing wings have a mutually equivalent form and equivalent conical seal faces for forming abutments against their respective conical support faces of each respective armature member.

The present invention finds its application in a series of different areas of use, that is to say during moderate working conditions as well as during extreme working conditions.

The expression " armature members " is employed herein for indicating that there are under discussion various types of " armature ". In the present embodiment however the invention is illustrated in connection with an armature in the form of a pipe coupling.

During moderate working conditions there can be employed for example a sealing ring of rigid plastic or another suitable material, while under extreme working conditions, for example in a pipe coupling, there can be
5 employed according to the illustrated embodiment a metallic sealing ring.

It is generally known to employ a metallic sealing ring of T - shaped annular cross-section in an intermediate space between two opposite coupling pieces of
10 a pipe coupling. Such a pipe coupling can be used for example when high pressure and tensile loadings occur axially in the pipe coupling and when at the same time extreme internal medium pressure can occur in the joint between the coupling pieces/the armature members. In what
15 follows " coupling piece " will be indicated as armature member.

An example of such a known solution is shown in NO 178 388. Therein it is shown that the stem of the T-shape is clamped together via opposite side faces, in the axial
20 direction of the pipe coupling, at the same time as laterally directed sealing flaps of the T-shape are clamped each via its cone face in the axial direction and radial direction of the pipe coupling for sealing abutment against a respective cone face of a stopper of a
25 respective armature member.

By clamping together the stem of the T-shape in the axial direction the sealing ring is locked in place in the intended use position, that is to say in an intended immovable use position. At the same time by arrangement of
30 the sealing flaps in a sealing abutment against the

ring during use, than that which is a prerequisite according to NO 303 150.

However the solution according to the invention is not limited to such use, as indicated in NO 303 150, but
5 can as mentioned above find application for a series of various other purposes. The sealing arrangement according to the invention can for example find application in areas where there is a need for substantially simpler sealing arrangements than proposed in said patent, but where in
10 addition it is favourable having a slidable sealing engagement between sealing ring and armature members.

The sealing arrangement according to the invention is characterised in that the sealing wings of the sealing ring are elastically deformable, and that the sealing ring
15 during use is supported in a radial direction of the armature members via three axially separate corresponding annular faces facing radially, the sealing wings during use forming both slidable sealing and slidable impact against a respective conical, combined sealing and slide
20 face of each of the armature members, while the stem of the sealing ring during use has a certain degree of fit in an axial direction and is adapted to be supported with a sliding fit against an associated armature member via a middle, combined support and slide face at the outer end
25 of the stem of the T-shape.

By means of the middle support and slide face, which is arranged in a sealing ring stem, which preferably is rigid and shape stable, it is possible during use for the sealing ring to move unhindered relative to each of the
30 armature members, inter alia for equalising of, that is to

FIG. 8

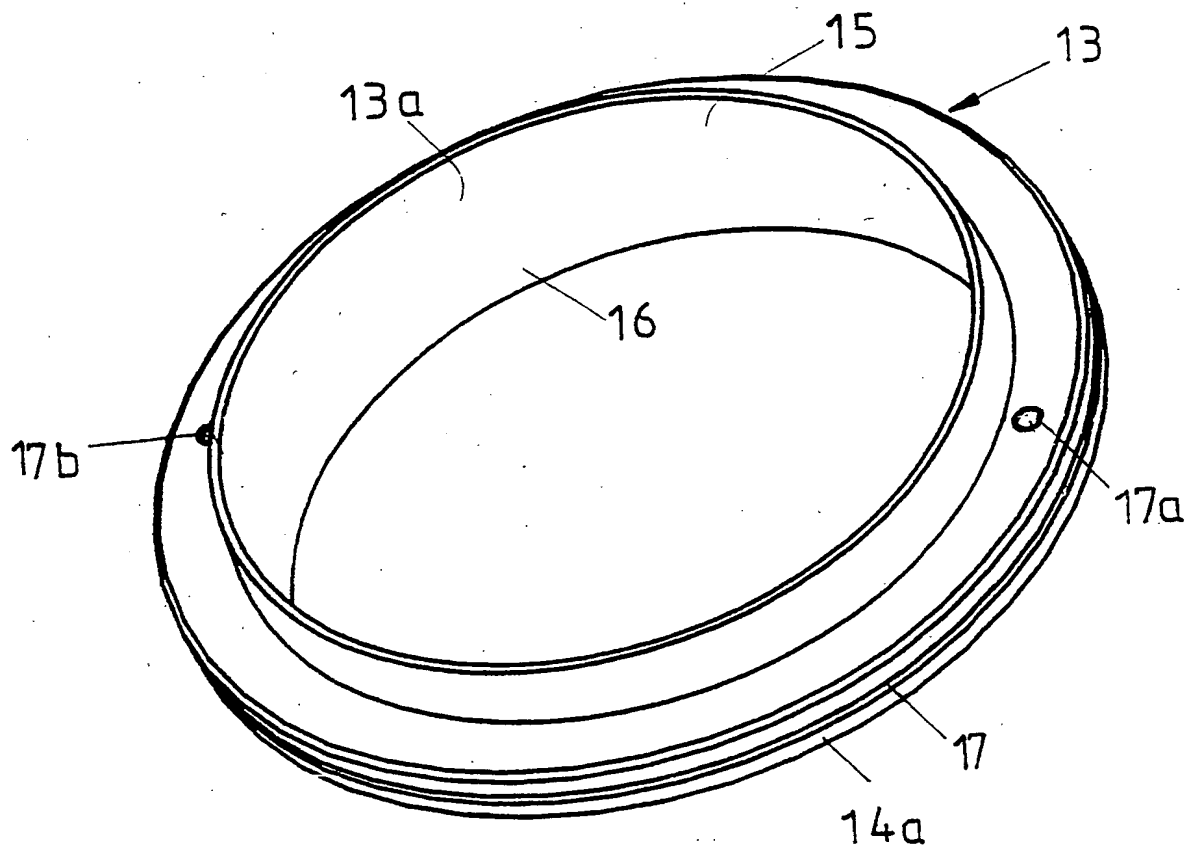
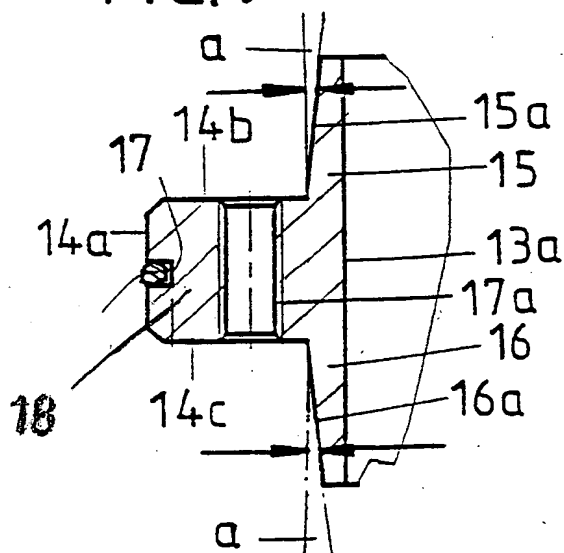


FIG. 9



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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference J00/iek	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/NO 00/00017	International filing date (day/month/year) 26 January 2000	(Earliest) Priority Date (day/month/year) 28 January 1999
Applicant Den Norske Metallpakningsfabrikk AS et al		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (See Box I).
2. ☐ Unity of invention is lacking (See Box II).
3. ☐ The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing
 - ☐ filed with the international application.
 - ☐ furnished by the applicant separately from the international application,
 - ☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
 - ☐ transcribed by this Authority.
4. With regard to the title, ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:
5. With regard to the abstract,
 - ☒ the text is approved as submitted by the applicant.
 - ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is:
Figure No. 11
 - ☐ as suggested by the applicant. ☐ None of the figures.
 - ☒ because the applicant failed to suggest a figure.
 - ☐ because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 00/00017

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F16L 23/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AT 392143 B (URDL FRANZ), 25 January 1991 (25.01.91), figures 1,6	1,4,6
Y	--	2,5
Y	DE 3723386 A1 (DEUTSCHE GESELLSCHAFT FÜR WIEDERAUFARBEITUNG VON KERNBRENNSTOFFEN MBH ET AL), 26 January 1989 (26.01.89), figures 1-3	2,5
Y	US 5570911 A (GALLE), 5 November 1996 (05.11.96), figure 6	2
	--	

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

31 March 2000

Date of mailing of the international search report

22-05-2000

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Axel Lindhult / JA A
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.

PCT/NO 00/00017

Patent document cited in search report			Publication date	Patent family member(s)			Publication date
AT	392143	B	25/01/91	AT	82289	A	15/07/90
				DE	9003735	U	07/06/90
DE	3723386	A1	26/01/89	DE	3866296	A	02/01/92
				EP	0299324	A,B	18/01/89
				JP	1030991	A	01/02/89
				US	4953580	A	04/09/90
US	5570911	A	05/11/96	BR	9601289	A	13/01/98
				FR	2732743	A	11/10/96
				GB	2299837	A,B	16/10/96
				GB	9600084	D	00/00/00
				IT	1283713	B	30/04/98
				IT	MI960637	A	01/10/97
				NO	955135	A	11/10/96
WO	9318331	A1	16/09/93	AT	156576	T	15/08/97
				CA	2131803	A	16/09/93
				DE	69312917	D,T	19/03/98
				EP	0630457	A,B	28/12/94
				GB	2265196	A,B	22/09/93
				JP	7504481	T	18/05/95
				NO	943340	A	09/09/94
				US	5466018	A	14/11/95
EP	0222027	A1	20/05/87	DE	3420135	A,C	05/12/85
NO	178388	B	04/12/95	CA	2022675	A	09/02/91
				DE	69001524	T	02/12/93
				DK	412677	T	09/08/93
				EP	0412677	A,B	13/02/91
				NO	903463	D	00/00/00
				US	5016920	A	21/05/91

INTERNATIONAL SEARCH REPORT
Information on patent family members

02/12/99

International application No.

PCT/NO 00/00017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
AT 392143 B	25/01/91	AT 82289 A	15/07/90
		DE 9003735 U	07/06/90
DE 3723386 A1	26/01/89	DE 3866296 A	02/01/92
		EP 0299324 A,B	18/01/89
		JP 1030991 A	01/02/89
		US 4953580 A	04/09/90
US 5570911 A	05/11/96	BR 9601289 A	13/01/98
		FR 2732743 A	11/10/96
		GB 2299837 A,B	16/10/96
		GB 9600084 D	00/00/00
		IT 1283713 B	30/04/98
		IT MI960637 A	01/10/97
		NO 955135 A	11/10/96
WO 9318331 A1	16/09/93	AT 156576 T	15/08/97
		CA 2131803 A	16/09/93
		DE 69312917 D,T	19/03/98
		EP 0630457 A,B	28/12/94
		GB 2265196 A,B	22/09/93
		JP 7504481 T	18/05/95
		NO 943340 A	09/09/94
		US 5466018 A	14/11/95
EP 0222027 A1	20/05/87	DE 3420135 A,C	05/12/85
NO 178388 B	04/12/95	CA 2022675 A	09/02/91
		DE 69001524 T	02/12/93
		DK 412677 T	09/08/93
		EP 0412677 A,B	13/02/91
		NO 903463 D	00/00/00
		US 5016920 A	21/05/91

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference JOO/iek	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/NO00/00017	International filing date (day/month/year) 26/01/2000	Priority date (day/month/year) 28/01/1999
International Patent Classification (IPC) or national classification and IPC F16L23/18		
Applicant DEN NORSKE METALLPAKNINGSFBRIKK AS et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 7 sheets, including this cover sheet.
 - ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 10 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 25/08/2000	Date of completion of this report 12.04.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Dauvergne, B Telephone No. +49 89 2399 7527 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NO00/00017

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17):*

Description, pages:

3-6,8-24	as originally filed	
1,1A,2,2A,7,7A	with telefax of	22/01/2001

Claims, No.:

1-5	with telefax of	22/01/2001
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Drawings, sheets:

1/10-7/10,9/10, 10/10	as originally filed	
8/10	with telefax of	22/01/2001

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/NO00/00017

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application.
- ☒ claims Nos. 5.

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 5 are so unclear that no meaningful opinion could be formed (*specify*):
see separate sheet
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

- ☐ the written form has not been furnished or does not comply with the standard.
- ☐ the computer readable form has not been furnished or does not comply with the standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NO00/00017

citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 3, 4
	No: Claims 1, 2
Inventive step (IS)	Yes: Claims
	No: Claims 1-4
Industrial applicability (IA)	Yes: Claims 1-4
	No: Claims

2. Citations and explanations see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

In the light of the comments relating to claim 5 in part VIII, it appears that this claim is too unclear to be subject to examination. As a consequence, the claim has not been examined.

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: AT 392 143 B

D2: DE 37 23 386 A

1- Novelty

The subject matter of claims 1, 2 lacks novelty (Art. 33.2 PCT) because their features are known from D1.

1-1 Claims 1:

From D1, a sealing arrangement is known. It comprises two armature members (1, 2, Fig.1) and a sealing ring (7, Fig.1) between them. A clamping device (17, Fig.3) is also present for clamping the armature members against each other. The sealing ring can be made of metal (see abstract) and has a T-shaped annular cross section, and is provided with two sealing wings projecting axially outwards in opposite directions, each having a radially outwards facing sealing face (9 Fig.1). Between these extensions, a stem extending radially outwards is present, provided with a gliding and support face (top of 8, Fig.1) that is supported against a counter face. Each of the sealing faces may be conically shaped to be supported against a correspondingly conically shaped support face (see Fig.4 or Fig.3) in the armature. Each of the armature members extend under a first cone angle smaller than that of the sealing wings (page 3, lines 19-20).

The sealing face being a surface of the sealing wing, it thus has the same axial extension. The sealing face is furthermore continuous (Fig.1). It may also be tapered, in the axial direction, from the stem (see Fig.5). As any metal piece, the ring, and thus its sealing wings, can be considered as elastically deformable. There is no indication in D1 that a plastic deformation will occur systematically.

Each sealing wing may further have a cross sectional dimension increasing from its outer end portion to the stem (see Fig.3).

2- Inventive step

The subject matter of claims 3, 4 would appear to lack an inventive step (Art. 33.3 PCT) for the following reasons:

2-1 Claims 3, 4:

D2 discloses a coupling in which the counter face extends in the radial direction and solely in one of the armature members. These members form part of the clamping means and support each other along mutually opposite conical support surfaces. Such a configuration, with the ring of D1 would lead to an apparatus having all the features of claims 3 and 4 of the present application.

Re Item VIII

Certain observations on the international application

1- Claim 1:

Claim 1 does not meet the requirements of Article 6 PCT in that the matter for which protection is sought is defined in vague terms, the claim attempting to define the subject-matter in terms of the result to be achieved. The claim furthermore refers to the notion of 'axial extension' which is not defined in the description.

2- Claim 4:

Claim 4 does not meet the requirements of Article 6 PCT in that the matter for which

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/NO00/00017

protection is sought is defined in vague terms, the claim attempting to define the subject-matter in terms of the result to be achieved.

3- Claim 5:

Claim 5 also attempts to define the subject-matter in terms of the result to be achieved. The absence of a conjugated verb in the characterising portion renders this claim ununderstandable.

5

Sealing Arrangement.

Present invention relates to a sealing arrangement comprising two separate armature members and a sealing ring interposed therebetween and a clamping device for clamping the armature members against each other causing the intermediate sealing ring to be loaded with a sealing force, said sealing ring being made of metal or similar material and having a substantially T-shaped annular cross-section, said T-shape being provided with two in opposite axial direction extending sealing wings, each with an radially outwards facing sealing face and therebetween a central, rather rigid stem extending radially outwards and being provided with a combined gliding and support face to be supported against a counter face in the sealing arrangement, each of said sealing faces being conically shaped to be supported against a radially surrounding, correspondingly conically shaped gliding and support face in a corresponding armature member, each of said conical support faces of said armature members extends under a first, smallest cone angle, whereas each of said said sealing wings extends under a second, greatest cone angle, prior to mounting, and after mounting extends under said first cone angle to form a tight sealing abutment against its corresponding support face.

The present invention finds its application in a series of different areas of use, that is to say during moderate working conditions as well as during extreme working conditions.

The expression " armature members " is employed herein for indicating that there are under discussion

SUBSTITUTION SHEET

AMENDED SHEET

1a

various types of " armature ". In the present embodiment however the invention is illustrated in connection with an armature in the form of a pipe coupling.

SUBSTITUTION SHEET

AMENDED SHEET

During moderate working conditions there can be employed for example a sealing ring of rigid plastic or another suitable material, while under extreme working conditions, for example in a pipe coupling, there can be employed according to the illustrated embodiment a metallic sealing ring.

It is generally known to employ a metallic sealing ring of T - shaped annular cross-section in an intermediate space between two opposite coupling pieces of a pipe coupling. Such a pipe coupling can be used for example when high pressure and tensile loadings occur axially in the pipe coupling and when at the same time extreme internal medium pressure can occur in the joint between the coupling pieces/the armature members. In what follows " coupling piece " will be indicated as armature member.

An example of such a known solution is shown in NO 178 388. Therein it is shown that the stem of the T-shape is clamped together via opposite side faces, in the axial direction of the pipe coupling, at the same time as laterally directed sealing flaps of the T-shape are clamped each via its cone face in the axial direction and radial direction of the pipe coupling for sealing abutment against a respective cone face of a stopper of a respective armature member.

An other example of such known solution is shown in AU 392 143. It is suggested therein that the sealing faces of the sealing wings of the sealing ring has a cone angle of 1° - 2° steeper than that of the support face of the armature members. This will or may result in permanent deformation of the sealing ring in cases wherein the sealing faces are loaded with extreme pressure load. In practice this will involve that the sealing ring during mounting or hence during use is over-loaded and destroyed by exceeding the yield point of the metallic sealing ring and the latter is to be shifted. This will involve a time consuming and expensive shifting operation, especially in oil and gass drilling operations.

SUBSTITUTION SHEET

AMENDED SHEET

It is to be noted, with reference to AU 392 143, that said sealing faces are solely located at the outer ends of the sealing wings, i.e. at a considerable distance from the sealing ring stem. By spacing the conic faces of the armature members from the conic faces of the inner portion of the sealing wing over a considerable axial distance the sealing face area is clearly restricted and an intended high moment force is achieved in the sealing face area. Such high sealing forces, when occurring as instantaneous peak pressures in gass or oil drilling pipes, may quite often cause permanent deformation of the sealing ring and a following leaking that will require shifting of a destroyed sealing ring.

By clamping together the stem of the T-shape in the axial direction the sealing ring is locked in place in the intended use position, that is to say in an intended immovable use position. At the same time by arrangement of the sealing flaps in a sealing abutment against the

SUBSTITUTION SHEET

AMENDED SHEET

ring during use, than that which is a prerequisite according to NO 303 150.

5 However the solution according to the invention is not limited to such use, as indicated in NO 303 150, but can as mentioned above find application for a series of various other purposes. The sealing arrangement according to the invention can for example find application in areas where there is a need for substantially simpler sealing arrangements than proposed in said patent, but where in addition it is favourable having a slidable sealing engagement between sealing ring and armature members.

10 The sealing arrangement according to the invention is characterised in that each sealing face of said sealing ring has the same axial extension as that of the associated sealing wing, and each sealing face has a continuous, rectilinear extension in axial direction of the sealing wing, and each sealing wing is tapering in axial direction from the stem and is elastically deformable in relation to the stem in order to secure a controlled elastic deformation of the sealing wing.

20 According to the invention it is possible to obtain considerable advantages by allowing the sealing wings of the sealing ring to be deformed elastically in a controlled manner during mounting of the sealing ring as well as in use of the sealing ring under varying working conditions.

25 One advantage is that it is possible to operate the sealing arrangement in a controlled manner to keep occurring forces well beyond the yield point of the metallic sealing ring material.

30 An other advantage is especially achieved by allowing the sealing faces of the elastically deformable sealing ring to slide in a controlled manner along its associated support faces in the armature members. This is especially the case during existing high extern or intern temperature variations and/or under occurring extreme peak load situations within an associated gass or oil piping. By combining a controlled elastic deformation of the sealing

SUBSTITUTION SHEET

AMENDED SHEET

wings and a controlled sliding support of the sealing ring in all of its counter faces it is in a surprisingly simple manner possible to operate occurring loads in a controlled manner beyond the yield point of the metallic sealing ring material.

5 In DE 37 23 386 it is suggested to provide a cavity in one of the armature members to insert the whole of the sealing ring therein. The radial support face of the sealing ring is supported in radial direction by an
10 annular spring located in a radial groove in said cavity. Such suggestion will prevent a controlled gliding support of the sealing ring in said cavity.

This problem is solved according to the present invention in that said counter face extends continuously
15 in axial direction and solely in one of the armature members to support the support face of the stem in a continuous gliding support directly against said counter face.

By means of the middle support and slide face, which
20 is arranged in a sealing ring stem, which preferably is rigid and shape stable, it is possible during use for the sealing ring to move unhindered relative to each of the armature members, inter alia for equalising of, that is to

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Patent Claims

1. Sealing arrangement (10,10') comprising two
5 separate armature members (11,12) and a sealing ring
(13,13') interposed therebetween and a clamping device
(30) for clamping the armature members (11,12) against
each other causing the intermediate sealing ring (13,13')
to be loaded with a sealing force, said sealing ring
10 (13,13') being made of metal or similar material and
having a substantially T-shaped annular cross-section,
said T-shape being provided with two in opposite axial
direction extending sealing wings (15,16), each with an
radially outwards facing sealing face (15a,15b), and
15 therebetween a central, rather rigid stem (14) extending
radially outwards and being provided with a combined
gliding and support face (14a) to be supported against a
counter face (22) in the sealing arrangement, each of said
sealing faces (15a,15b) being conically shaped to be
20 supported against a radially surrounding, correspondingly
conically shaped gliding and support face (21,25) in a
corresponding armature member (11,12), each of said
conical support faces (21,25) of said armature members
(11,12) extends under a first, smallest cone angle (a),
25 whereas each of said said sealing wings (13,13') extends
under a second, greatest cone angle (b), prior to
mounting, and after mounting extends under said first cone
angle (a) to form a tight sealing abutment against its
corresponding support face (21,25), characterised in that
30 each sealing face (15a,16a) of said sealing ring
(13,13') has the same axial extension as that of the
associated sealing wing (15,16), and
each sealing face (15a,16a) has a continuous,
rectilinear extension in axial direction of the sealing
35 wing (15,16), and
each sealing wing (15a,16a) is tapering in axial
direction from the stem (14) and is elastically deformable
in relation to the stem (14) in order to secure a

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controlled elastic deformation of the sealing wing (15,16).

2. Arrangement in accordance with claim 1,
5 characterised in that

each sealing wing (15,16) in radial direction has a relatively small cross-sectional dimension, increasing from a minimum at its outer end portion to a maximum at its inner end portion by the stem (14), and

10 each sealing wing (15,16) in a axial direction has a relatively large cross-sectional dimension, to obtain support of the sealing wings (15,16) along a major area of the respective support surfaces (21,25),

15 both cross-sectional dimension being relative in respect of the cross-sectional dimensions of the stem (14), which in axial as well as in radial direction is relatively large to provide a rather rigid stem (14).

3. Arrangement in accordance with claim 1 or 2,
20 characterised in that

the counter face (22) extends continuously in axial direction and solely in one of the armature members (11,12), providing a continuous gliding support for the support face (14a) of the stem (14) directly against said
25 counter face (22).

4. Arrangement in accordance with one of claims 1-3,
characterised in that

30 the clamping means (30) comprises two in radial direction mutually overlapping armature member portions (26,27) extending radially outside of the sealing ring (13,13'),

35 said armature member portions (26,27) is supporting each other along mutually opposite conical support surfaces extending obliquely with a central axis of the sealing arrangement to provide a controlled stopp forming abutment between the armature member (11,12).

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5. Arrangement in accordance with one of claims 1-3 and claim 4, characterised in that

the combination of the oblique extension of said mutually overlapping, stop forming armature member portions (26,27) and said elastically deformable wings (15,16) of the sealing ring (13,13') to provide controlled gliding movements in the sealing arrangement during use.

10

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FIG. 8

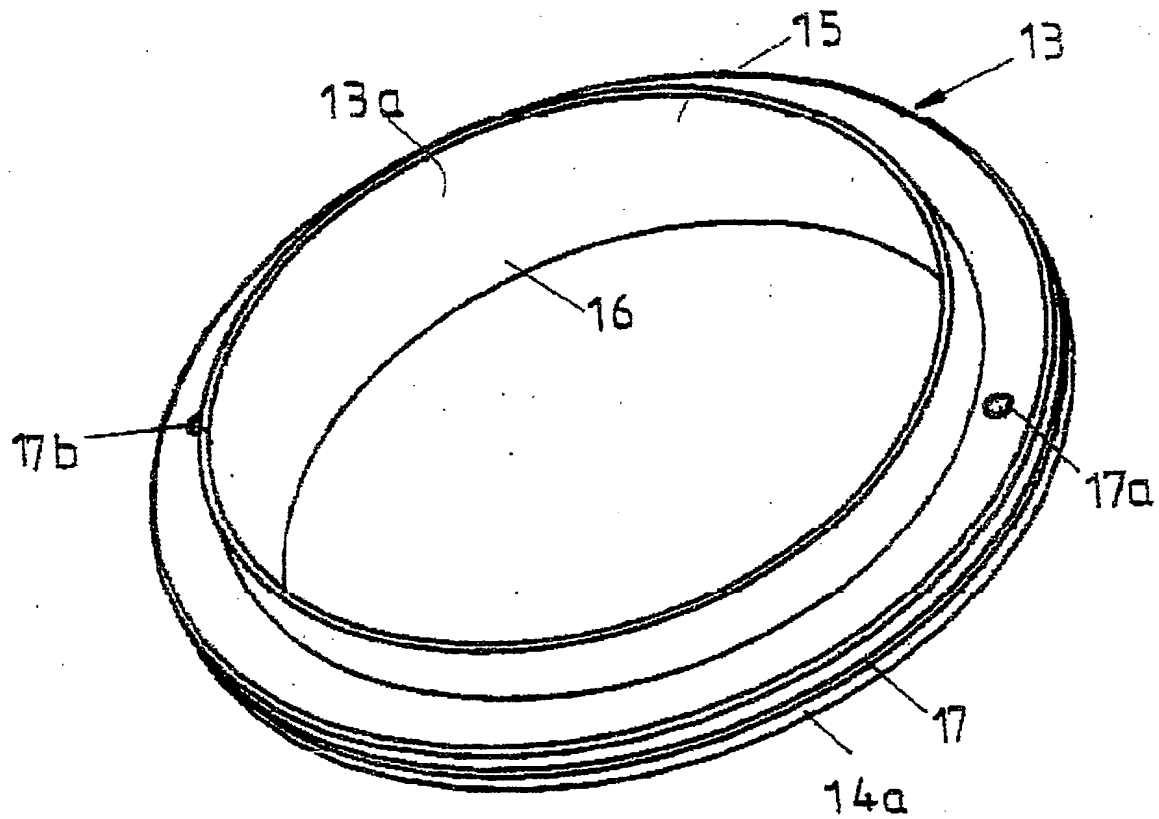
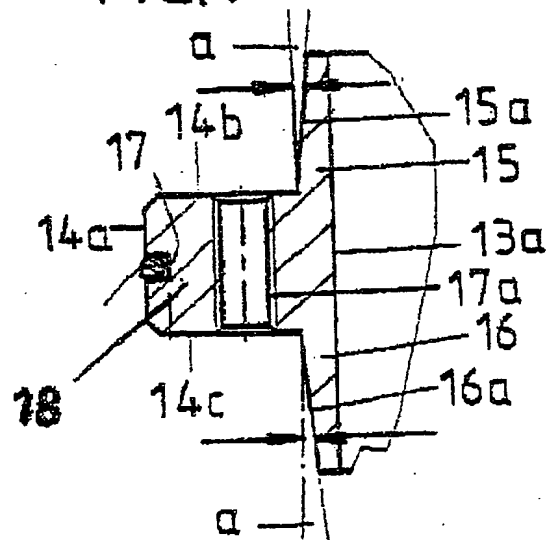


FIG. 9



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CONFIRMATION
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BERGEN - NORWAY
22.01.01

Re.: International Application No PCT/NO00/00017.
Applicant: DEN NORSKE METALLPAKNINGSFABRIKK AS et al.

Reference is being had to Written Opinion 24.10.2000.

Firstly, please note, that there is a clear distinction in the present invention from what has been stated in references D1 and D2. Original claims have been revised to clearly point out this distinction and enclosed is a set of new claims to substitute the claims on file.

Enclosed are substitute pages 1,1a of the specification with amendments corresponding to the amendments made in the substituted claim 1. Substitute pages 2,2a respectively substitute pages 7,7a has included therein comments to references D1 and D2 (the latter in respect of amendments in substituted claim 3).

Further is enclosed a substitute drawing containing amended Fig. 9 wherein the missing reference number 18 is included.

The enclosed new claim 1 is based on the following three characterising features:

I) each sealing face (15a,16a) of said sealing ring (13,13') has the same axial extension as that of the associated sealing wing (15,16),

II) each said sealing face (15a,16a) has a continuous, rectilinear extension in axial direction of the sealing wing (15,16),

III) each said sealing wing (15a,16a) is tapering in axial direction from the stem (14) and is elastically deformable in relation to the stem (14) in order to secure a controlled elastic deformation of the sealing wing (15,16).

EL728214019US

Said features I and II are based on the specification page 17, lines 20-28. It is evident therefrom (as well as from the drawings Figs. 9-11) that the sealing faces projects from the stem axially outwards in the form of a conical face. In other words said sealing wings (and the sealing faces) are tapering from the stem. This enables use of rather thin-walled sealing wings.

Said feature III is partly based on the feature stated in original claim 1, lines 20-21. In addition it is for further clarification stated that the sealing wings are tapered and is elastically deformable in relation to the stem in order to secure a controlled elastic deformation of the sealing wing.

Please, note, that this revised formulation of the characterising clause of claim 1 should clearly define the present invention above the prior art solution of D1. In this respect it is of importance to understand the differences between the invention and the prior art of D1:

Comments in respect of feature I:

In D1 the sealing face extends about half the axial lenght of of the sealing wing. Please, note, that the sealing face of the present invention extends the complete lenght of the sealing wing as stated in feature I.

Comments in respect of feature II:

In D1 each of said sealing faces extends about half the axial lenght of the sealing wing, whereas the remainder of said axial lenght of the sealing wing is intentivly spaced from the opposed support surface in order to avoid support of the sealing ring at this portion. Please, also note, that each of said sealing faces of the present invention has a continuous, rectilinear extension in axial direction of the sealing wing (i.e. in the complete lenght thereof).

Accordingly, the general teaching of D1 is contrary to that of the present invention.

These different features are of importance in each matter and has to be valuated in corresponding separate manner.

The sealing face according to the present invention has a rectilinear extension over the whole lenght of the sealing face and its sealing wing. Said distinctions are vital in respect of securing a controlled and safe elastic deformation of the sealing wing.

Examiner states with reference to D1 that «The sealing wings form during use both slidable sealing and slidable thrust against a respective conical, combined sealing and slide face (5,5) of each of the armature members.» This effect is, however, solely present in D1 during the mounting operation in

itself, and not during use and certainly not during occurring peak loads and following deloading of such peak loads.

In D1 during mounting, i.e. during clamping of the armature members towards each other, a clamping load of several tons (say 60 tons) is transferred to the sealing faces of the sealing wings in order to deform the sealing faces against their respective support faces. Said load on the sealing face is in practice close to the yield point of the sealing ring material and may even surpass the yield point - resulting in permanent deformation.

In D1, at least during use, i.e. each time additional internal peak loads occur, caused by peak pressures produced by gas or oil transported in the associated pipe line, this will usually result in permanent deformation of the sealing ring. The yield point of the metallic material has been surpassed and the elastic sealing effect is accordingly destroyed. This result is especially caused by transferring said peak loads to an intended, restricted sealing face area.

Tensions in the sealing ring should under normal operation never surpass the Ra 0.2 Yield Strength. However, sealing rings of prior art, that presently are in operation in the market (say so-called BX and RX rings) will of structural reasons in combination with required high mounting loads be permanently deformed by mounting and/or by following use, and would thus require shifting of the destroyed sealing ring.

This problem is solved according to the present invention.

Comments in respect of feature III:

Examiner claim that the sealing wings of the sealing ring are elastically deformable and refer in this respect to page 2, line 5 of reference D1. In said line 5, page 2 it is solely stated:

«wobei deren Erzeugenden mit unterschiedlichen Neigung zu den Rohr- bzw. zur koaxialen Ringachse ausgebildet sind».

Said feature is more precisely stated on page 3, lines 19-20:

«Die Rohrdichtflächen (5) sind um etwa 1° -2° steiler zur Rohrachse geneigt als die Ringdichtfläche (9) zur Ringachse».

It is admitted that the sealing faces of the sealing ring are to be deformed to be completely supported against their associated support faces. However, please note, that there is no saying in D1 that said sealing face (9) would be elastically deformed.

It is usual in prior art embodiments that the sealing ring and the sealing surface during mounting and/or under use is being permanently deformed against its support face. This is assumed to be the case also in reference D1.

In practice it is usual that leak in the sealing arrangement is caused by such permanent deformation of the sealing ring. A leak will eventually take place caused by such permanent deformation. In due course such leak shall require shifting of the sealing ring and even its associated armature member. In fact said permanent deformation will in each case represent a latent destruction of sealing effect. I.e. as soon as a relative movement is provided between each sealing surface and its associated support surface a leak problem will be present. In all events the sealing ring has to be shifted each time the sealing arrangement is opened for operational purposes.

Such opening of the sealing arrangement and the resulting need for shifting the sealing ring, is a general problem, especially in oil and gas drilling operations. This problem is being solved in a simple and easily controllable manner by the present invention.

Please, note that the structure of the sealing wings of the sealing ring of D1 is not designed for elastic deformation as suggested by the Examiner. The cross-section of the sealing wings is illustrated with an radial extension being half of its axial extension. This means that the sealing wings are rather thick-walled and rather rigid. In order to deform the sealing face against the support face extreme loads would be required. By exerting such high mounting loads on the restricted sealing face it would be quite difficult to achieve elastic deformation of the rather thick-walled sealing wing.

In the present invention this problem is partly solved by a tapered, rather thin-walled sealing wing structure combined with increased sealing face areas. The cross-section of the sealing wings is in Figs. 9,10,11 illustrated with an radial extension being about 1/5 of its axial extension. This is vastly different from that of D1.

A sealing arrangement according to the present invention - as defined by the characterising features III of new claim 1 -has operated in a full scale test operation one and the same sealing ring, and has lasted during a period of two years, in an offshore oil well drilling operation. This is in practice a highly surprising practical result. During these two years period said sealing ring has been mounted and demounted more than 50 times during continuous practical operations. Said sealing ring is reported still to be in full operative function. This clearly shows that the solution of the present invention is a clear progress above prior art.

A sealing arrangement according to D1 has so far, i.e. since 1989 not been known to exist in the marked.

The sealing ring structure according to the present invention has the general effect that high internal fluid pressure, acting against the sealing ring, co-acts with the sealing ring

rather than counteract with the sealing ring. In D1 the restricted sealing face area combined with a high mounting load combined with high internal fluid pressure, has the opposite effect of that of the present invention, i.e. the total load will be extremely high.

When increased internal oil or gass pressure occur, the load on the sealing faces will increase to additional peaks. Correspondingly, under decreased internal oil or gass pressure the load on the sealing faces will decrease correspondingly. The elastic deformation of the sealing ring of the present invention will more easily and in a controlled manner allow relative movements between sealing faces and their support faces with substantially decreased loads compared to D1.

By using an optimal lenght of the sealing wing to support the sealing faces the result would additionally be that tear and wear of the sealing faces as well as the support faces will be substantially reduced.


Amendments of sub-claims.

Prior claims 2-6 are deleted/revised and in other words:

- New claim 2 relates to detailed structural features supporting the characterising features of claim 1.
- New claim 3 is based on prior claim 2 and also relates to detailed structural features supporting the characterising features of claim 1.
- New claims 4 and 5 are based on prior claims 5 and 6. The latter claims suggest a solution to reduce the required mounting load to provide elastic deformation of the sealing wings.

We are looking forward to receive a confirming message that prior objections are being met by our amendments and that the application is in condition for allowance.

Yours faithfully,
AS BERGEN PATENTKONTOR

for Reidar Gjertsen


Enclosures.

Sealing Arrangement.

Present invention relates to a sealing arrangement
10 comprising two separate armature members and a sealing
ring interposed therebetween and a clamping device for
clamping the armature members against each other causing
the intermediate sealing ring to be loaded with a sealing
force, said sealing ring being made of metal or similar
15 material and having a substantially T-shaped annular
cross-section, said T-shape being provided with two in
opposite axial direction extending sealing wings, each
with an radially outwards facing sealing face and
therebetween a central, rather rigid stem extending
20 radially outwards and being provided with a combined
gliding and support face to be supported against a counter
face in the sealing arrangement, each of said sealing
faces being conically shaped to be supported against a
radially surrounding, correspondingly conically shaped
25 gliding and support face in a corresponding armature
member, each of said conical support faces of said
armature members extends under a first, smallest cone
angle, whereas each of said said sealing wings extends
under a second, greatest cone angle, prior to mounting,
30 and after mounting extends under said first cone angle to
form a tight sealing abutment against its corresponding
support face.

The present invention finds its application in a
series of different areas of use, that is to say during
35 moderate working conditions as well as during extreme
working conditions.

The expression " armature members " is employed
herein for indicating that there are under discussion

various types of " armature ". In the present embodiment however the invention is illustrated in connection with an armature in the form of a pipe coupling.

During moderate working conditions there can be employed for example a sealing ring of rigid plastic or another suitable material, while under extreme working conditions, for example in a pipe coupling, there can be employed according to the illustrated embodiment a
5 metallic sealing ring.

It is generally known to employ a metallic sealing ring of T - shaped annular cross-section in an intermediate space between two opposite coupling pieces of
10 a pipe coupling. Such a pipe coupling can be used for example when high pressure and tensile loadings occur axially in the pipe coupling and when at the same time extreme internal medium pressure can occur in the joint between the coupling pieces/the armature members. In what
15 follows " coupling piece " will be indicated as armature member.

An example of such a known solution is shown in NO 178 388. Therein it is shown that the stem of the T-shape is clamped together via opposite side faces, in the axial
20 direction of the pipe coupling, at the same time as laterally directed sealing flaps of the T-shape are clamped each via its cone face in the axial direction and radial direction of the pipe coupling for sealing abutment against a respective cone face of a stopper of a
25 respective armature member.

An other example of such known solution is shown in AU 392 143. It is suggested therein that the sealing faces of the sealing wings of the sealing ring has a cone angle of 1°-2° steeper than that of the support face of the
30 armature members. This will or may result in permanent deformation of the sealing ring in cases wherein the sealing faces are loaded with extreme pressure load. In practice this will involve that the sealing ring during mounting or hence during use is over-loaded and destroyed
35 by exceeding the yield point of the metallic sealing ring and the latter is to be shifted. This will involve a time consuming and expensive shifting operation, especially in oil and gass drilling operations.

It is to be noted, with reference to AU 392 143, that said sealing faces are solely located at the outer ends of the sealing wings, i.e. at a considerable distance from the sealing ring stem. By spacing the conic faces of the armature members from the conic faces of the inner portion of the sealing wing over a considerable axial distance the sealing face area is clearly restricted and an intended high moment force is achieved in the sealing face area. Such high sealing forces, when occurring as instantaneous peak pressures in gass or oil drilling pipes, may quite often cause permanent deformation of the sealing ring and a following leaking that will require shifting of a destroyed sealing ring.

By clamping together the stem of the T-shape in the axial direction the sealing ring is locked in place in the intended use position, that is to say in an intended immovable use position. At the same time by arrangement of the sealing flaps in a sealing abutment against the

ring during use, than that which is a prerequisite according to NO 303 150.

However the solution according to the invention is not limited to such use, as indicated in NO 303 150, but
5 can as mentioned above find application for a series of various other purposes. The sealing arrangement according to the invention can for example find application in areas where there is a need for substantially simpler sealing arrangements than proposed in said patent, but where in
10 addition it is favourable having a slidable sealing engagement between sealing ring and armature members.

The sealing arrangement according to the invention is characterised in that each sealing face of said sealing ring has the same axial extension as that of the
15 associated sealing wing, and each sealing face has a continuous, rectilinear extension in axial direction of the sealing wing, and each sealing wing is tapering in axial direction from the stem and is elastically deformable in relation to the stem in order to secure a
20 controlled elastic deformation of the sealing wing.

According to the invention it is possible to obtain considerable advantages by allowing the sealing wings of the sealing ring to be deformed elastically in a controlled manner during mounting of the sealing ring as
25 well as in use of the sealing ring under varying working conditions.

One advantage is that it is possible to operate the sealing arrangement in a controlled manner to keep occurring forces well beyond the yield point of the
30 metallic sealing ring material.

An other advantage is especially achieved by allowing the sealing faces of the elastically deformable sealing ring to slide in a controlled manner along its associated support faces in the armature members. This is especially
35 the case during existing high extern or intern temperature variations and/or under occurring extreme peak load situations within an associated gass or oil piping. By combining a controlled elastic deformation of the sealing

wings and a controlled sliding support of the sealing ring in all of its counter faces it is in a surprisingly simple manner possible to operate occurring loads in a controlled manner beyond the yield point of the metallic sealing ring material.

In DE 37 23 386 it is suggested to provide a cavity in one of the armature members to insert the whole of the sealing ring therein. The radial support face of the sealing ring is supported in radial direction by an annular spring located in a radial groove in said cavity. Such suggestion will prevent a controlled gliding support of the sealing ring in said cavity.

This problem is solved according to the present invention in that said counter face extends continuously in axial direction and solely in one of the armature members to support the support face of the stem in a continuous gliding support directly against said counter face.

By means of the middle support and slide face, which is arranged in a sealing ring stem, which preferably is rigid and shape stable, it is possible during use for the sealing ring to move unhindered relative to each of the armature members, inter alia for equalising of, that is to

Patent Claims

1. Sealing arrangement (10,10') comprising two
 5 separate armature members (11,12) and a sealing ring
 (13,13') interposed therebetween and a clamping device
 (30) for clamping the armature members (11,12) against
 each other causing the intermediate sealing ring (13,13')
 to be loaded with a sealing force, said sealing ring
 10 (13,13') being made of metal or similar material and
 having a substantially T-shaped annular cross-section,
 said T-shape being provided with two in opposite axial
 direction extending sealing wings (15,16), each with an
 radially outwards facing sealing face (15a,15b), and
 15 therebetween a central, rather rigid stem (14) extending
 radially outwards and being provided with a combined
 gliding and support face (14a) to be supported against a
 counter face (22) in the sealing arrangement, each of said
 sealing faces (15a,15b) being conically shaped to be
 20 supported against a radially surrounding, correspondingly
 conically shaped gliding and support face (21,25) in a
 corresponding armature member (11,12), each of said
 conical support faces (21,25) of said armature members
 (11,12) extends under a first, smallest cone angle (a),
 25 whereas each of said said sealing wings (13,13') extends
 under a second, greatest cone angle (b), prior to
 mounting, and after mounting extends under said first cone
 angle (a) to form a tight sealing abutment against its
 corresponding support face (21,25), characterised in that
 30 each sealing face (15a,16a) of said sealing ring
 (13,13') has the same axial extension as that of the
 associated sealing wing (15,16), and
 each sealing face (15a,16a) has a continuous,
 rectilinear extension in axial direction of the sealing
 35 wing (15,16), and
 each sealing wing (15a,16a) is tapering in axial
 direction from the stem (14) and is elastically deformable
 in relation to the stem (14) in order to secure a

controlled elastic deformation of the sealing wing (15,16).

2. Arrangement in accordance with claim 1,
5 characterised in that

each sealing wing (15,16) in radial direction has a relatively small cross-sectional dimension, increasing from a minimum at its outer end portion to a maximum at its inner end portion by the stem (14), and

10 each sealing wing (15,16) in a axial direction has a relatively large cross-sectional dimension, to obtain support of the sealing wings (15,16) along a major area of the respective support surfaces (21,25),

both cross-sectional dimension being relative in
15 respect of the cross-sectional dimensions of the stem (14), which in axial as well as in radial direction is relatively large to provide a rather rigid stem (14).

3. Arrangement in accordance with claim 1 or 2,
20 characterised in that

the counter face (22) extends continuously in axial direction and solely in one of the armature members (11,12), providing a continuous gliding support for the support face (14a) of the stem (14) directly against said
25 counter face (22).

4. Arrangement in accordance with one of claims 1-3,
characterised in that

the clamping means (30) comprises two in radial
30 direction mutually overlapping armature member portions (26,27) extending radially outside of the sealing ring (13,13'),

said armature member portions (26,27) is supporting each other along mutually opposite conical support
35 surfaces extending obliquely with a central axis of the sealing arrangement to provide a controlled stopp forming abutment between the armature member (11,12).

5. Arrangement in accordance with one of claims 1-3
and claim 4, characterised in that

the combination of the oblique extension of said
mutually overlapping, stop forming armature member
5 portions (26,27) and said elastically deformable wings
(15,16) of the sealing ring (13,13') to provide controlled
gliding movements in the sealing arrangement during use.


10

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REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

TCYNO00/00017
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PCT/NO 00 / 0 0 0 17
International Application No.

2000 -01- 26 (26.01.00)
International Filing Date

 **PATENTSTYRET**
Styret for det industrielle rettvern
► PCT International application

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) JOO/iek

Box No. I TITLE OF INVENTION	
Sealing arrangement.	
Box No. II APPLICANT	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	<input type="checkbox"/> This person is also inventor.
DEN NORSKE METALLPAKNINGSFABRIKK AS Skuteviksvei 30 N-5035 Bergen Norway	Telephone No.
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Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
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HJERTHOLM, Ole Lepsøyneset N-5228 Lepsøy Norway	<input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)
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Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
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Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	Telephone No.
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The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

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Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claim indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1) (28 Jan 1999) 28.01.99	19990388	Norway		
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Box No. VIII CHECK LIST; LANGUAGE OF FILING

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request : 3

description (excluding sequence listing part) : 15

claims : 3

abstract : 1

drawings : 10

sequence listing part of description :

Total number of sheets : 32

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- ☐ separate signed power of attorney
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Figure of the drawings which should accompany the abstract:

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Bergen, January 25, 2000

AS BERGEN PATENTKONTOR


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FIG. 1

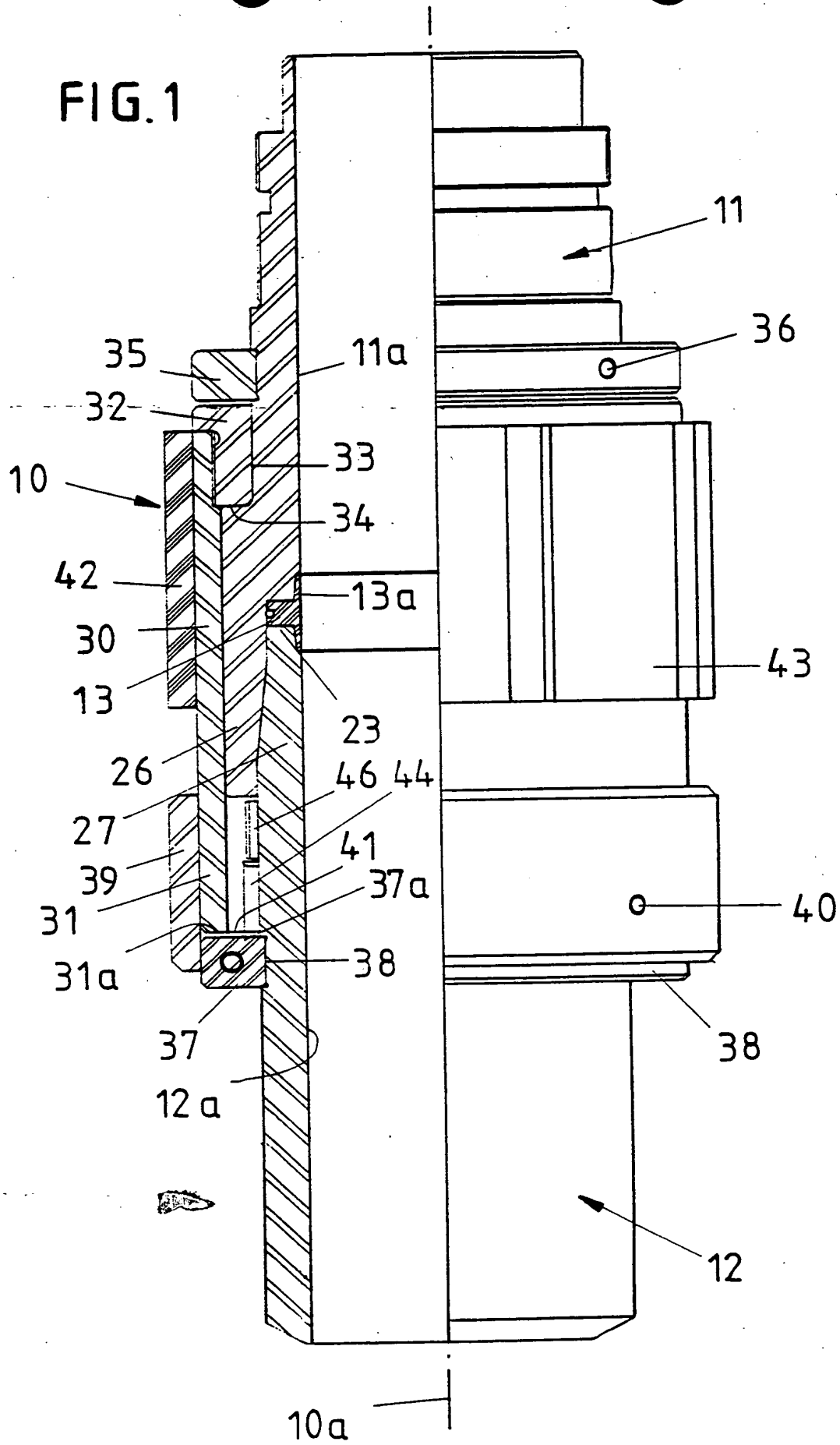


FIG. 1a

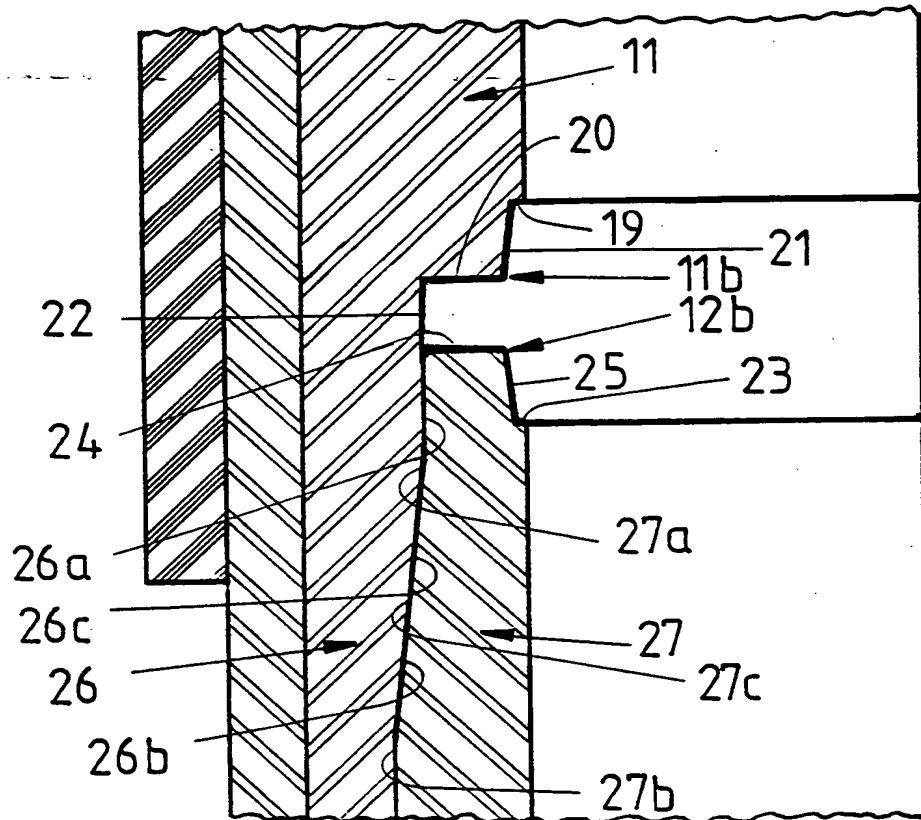


FIG. 2

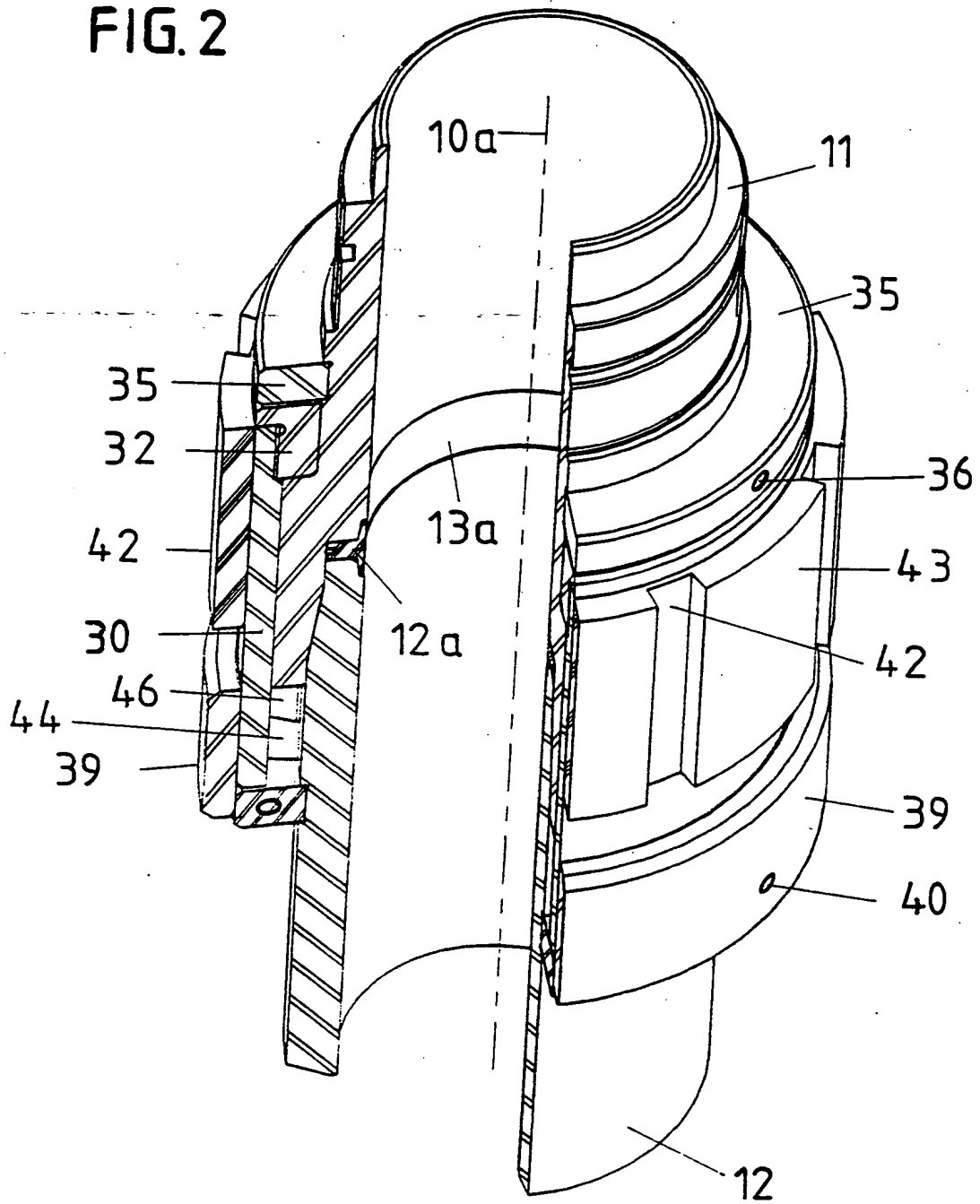


FIG.3

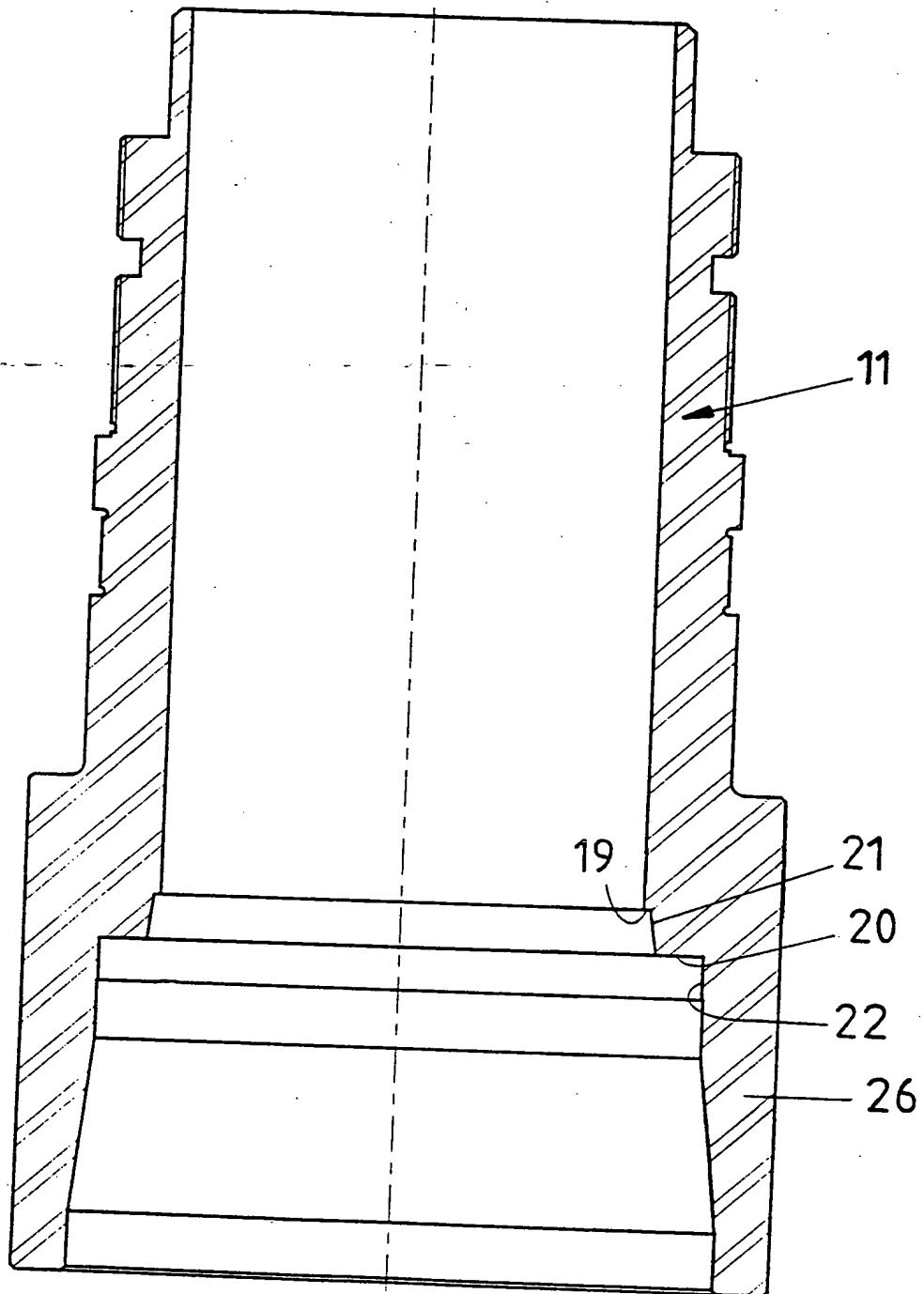


FIG. 4

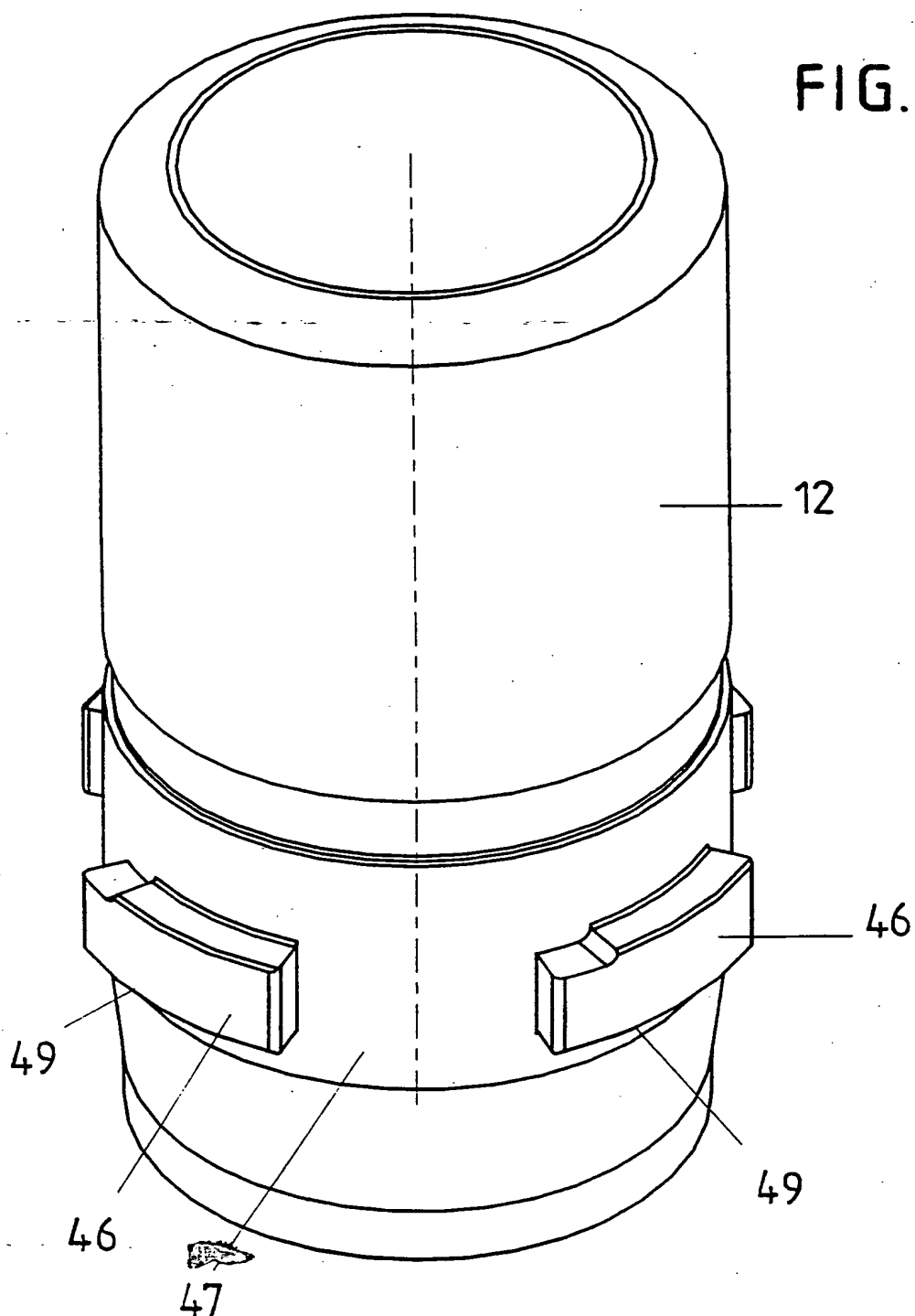


FIG. 5

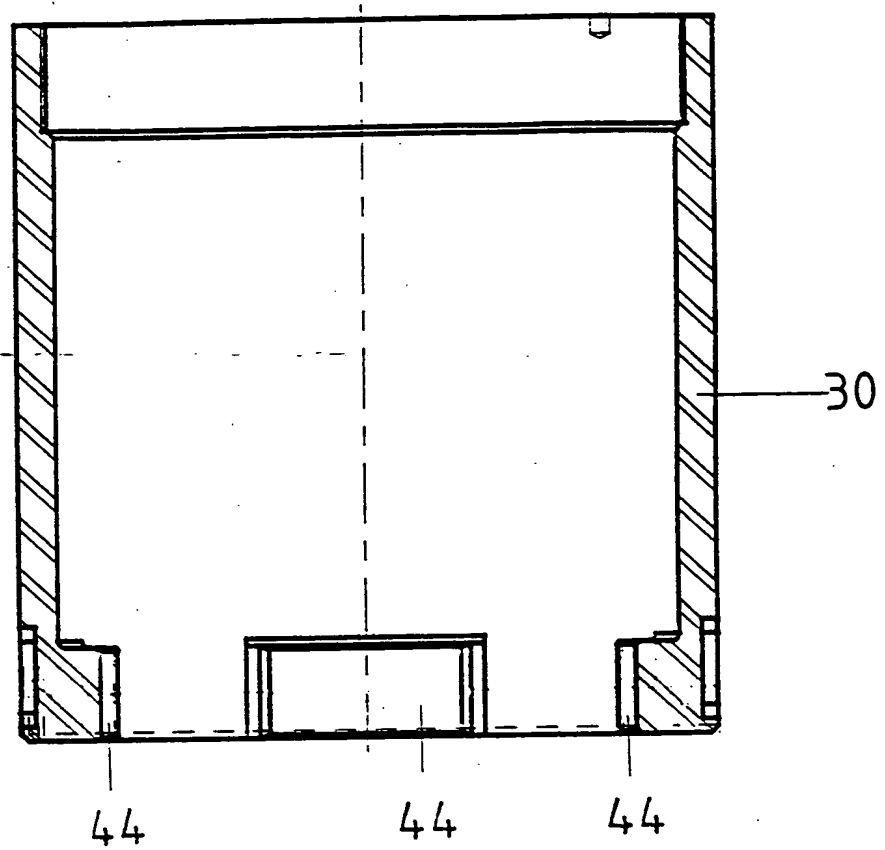


FIG. 5a

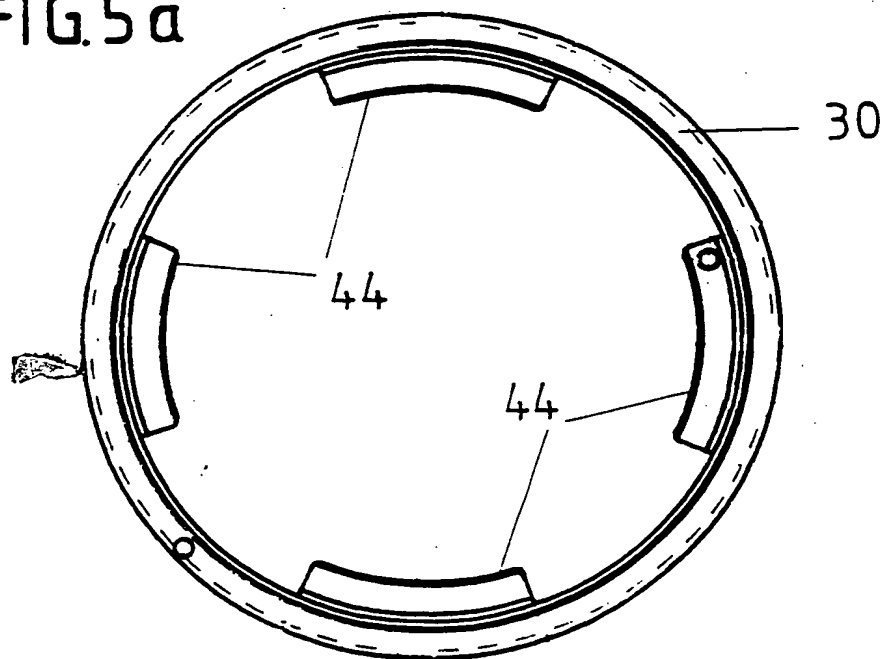


FIG. 6

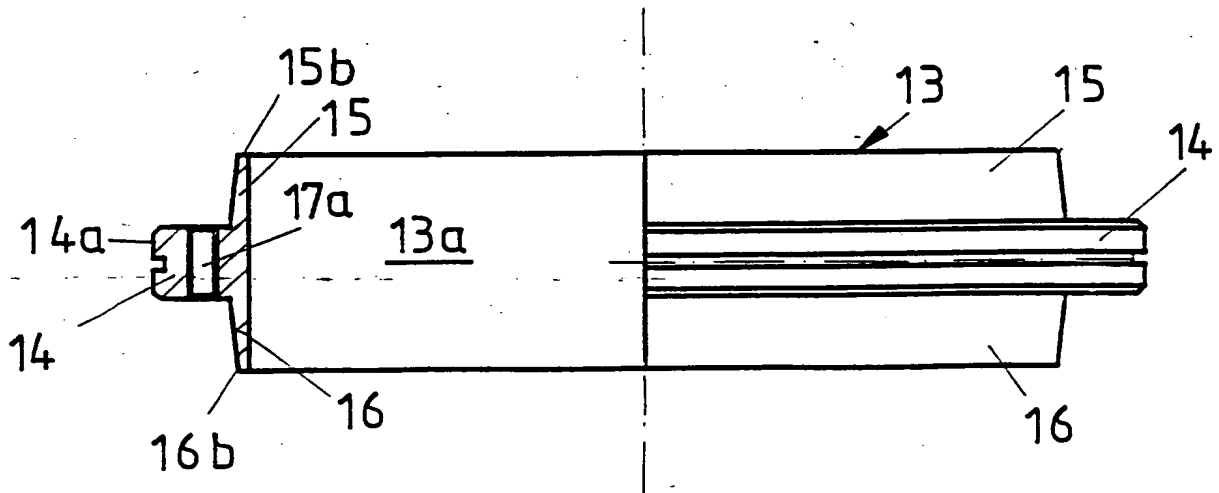


FIG. 7

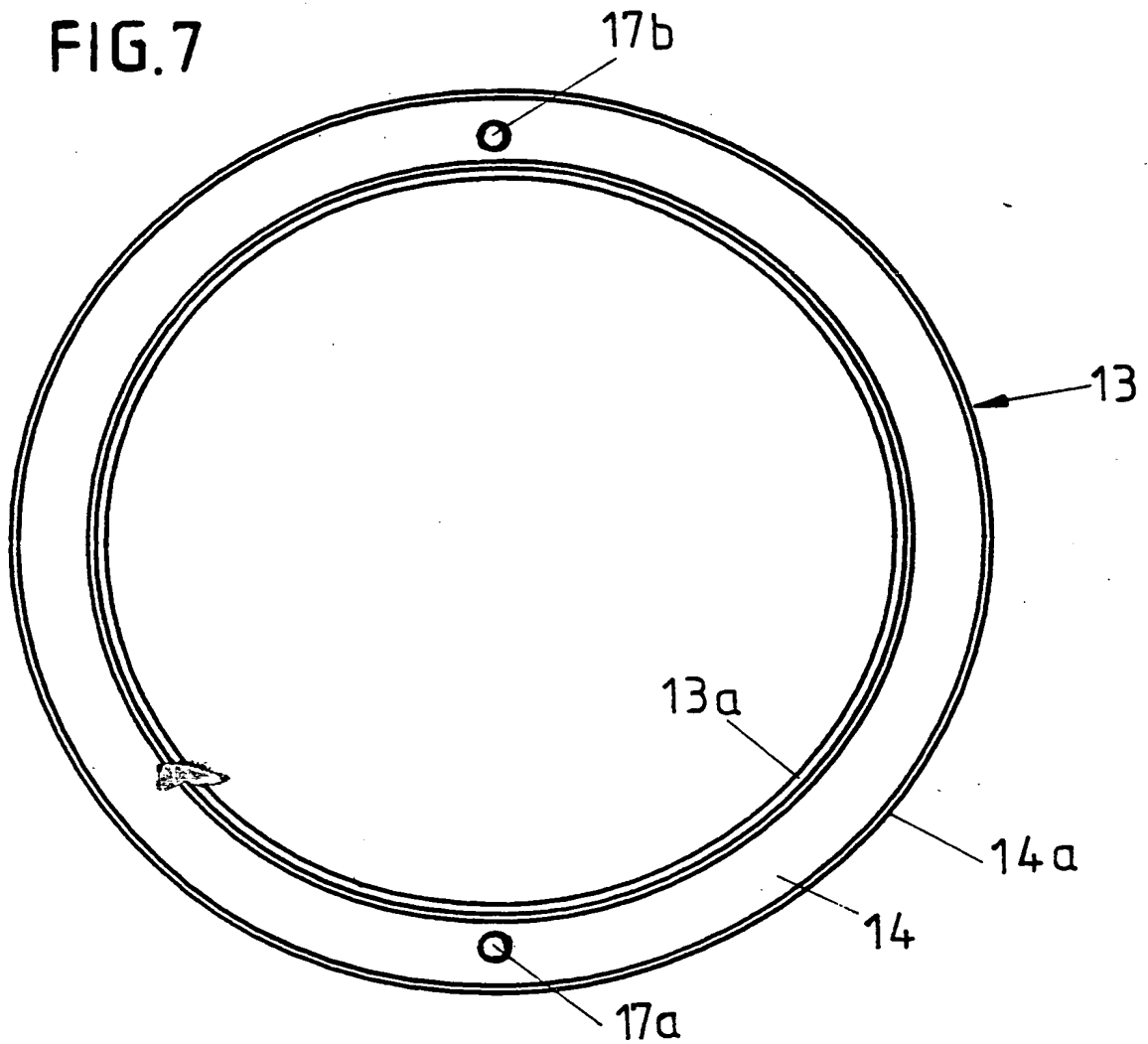


FIG. 8

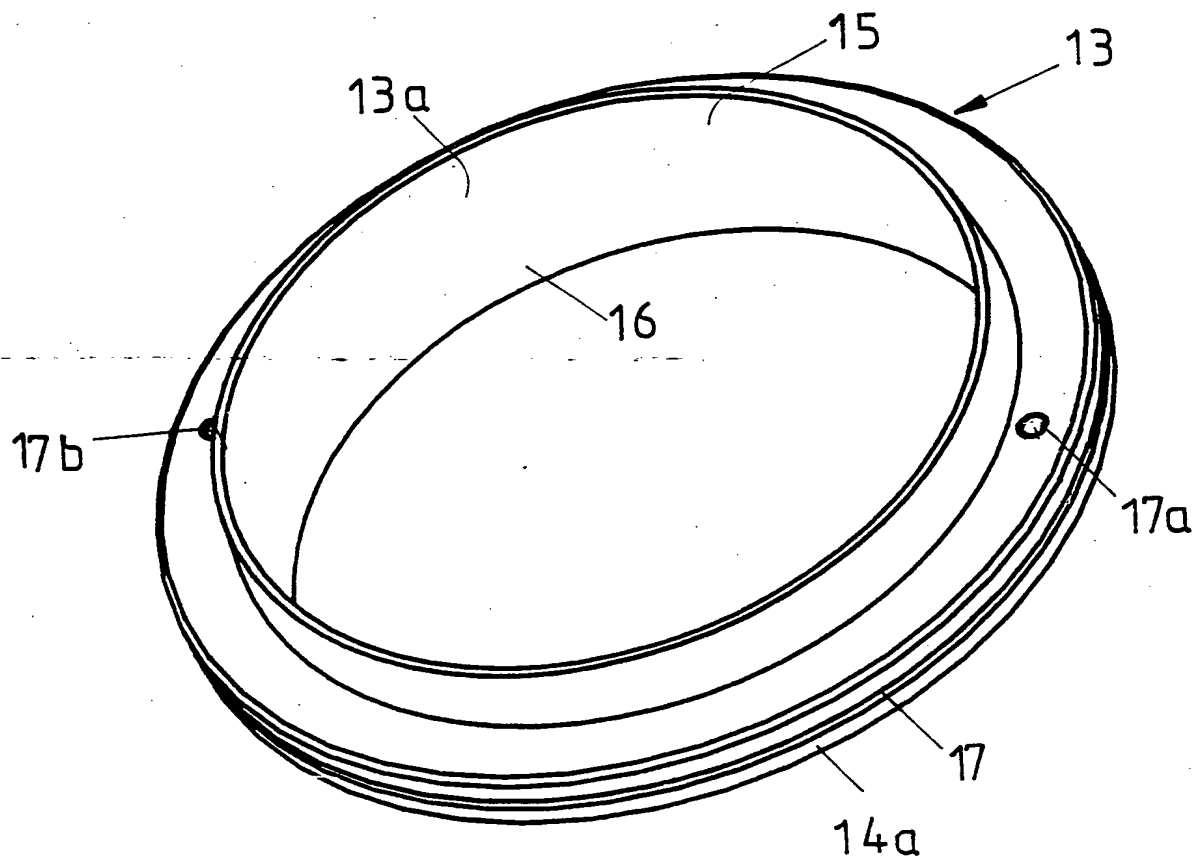
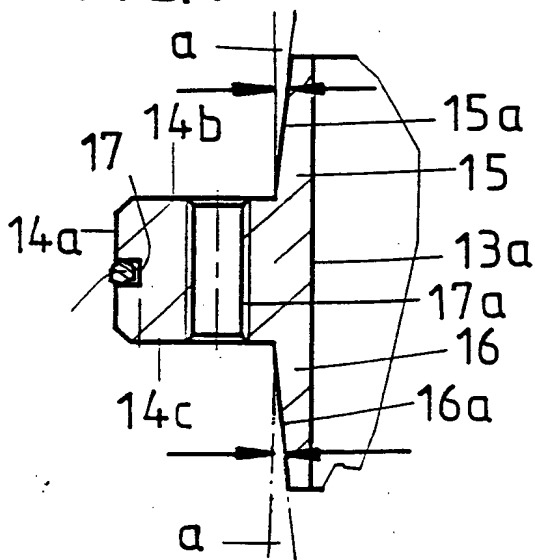
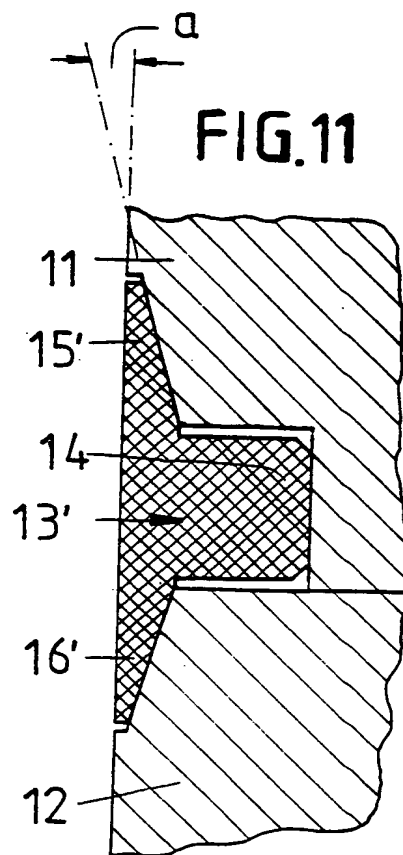
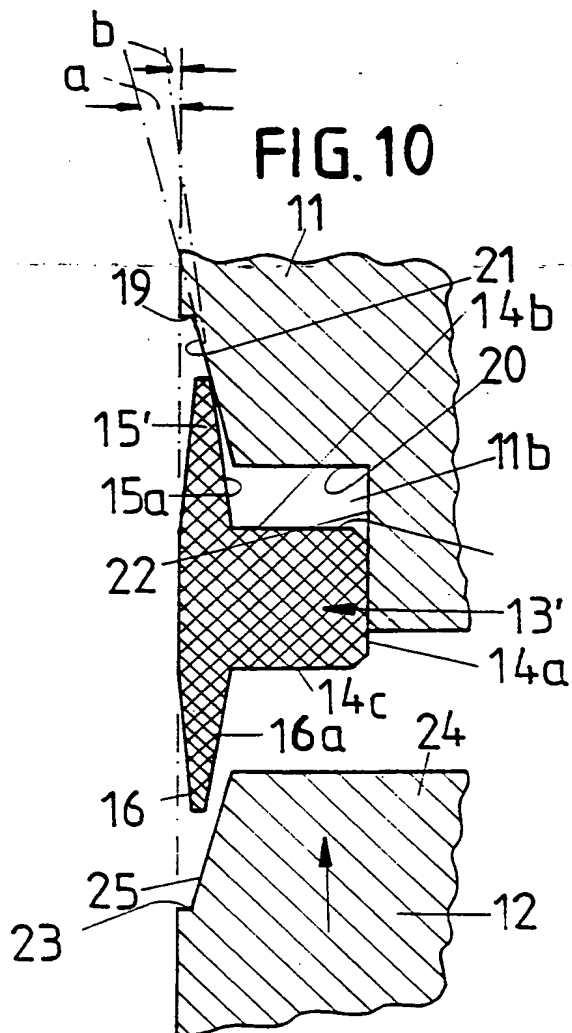
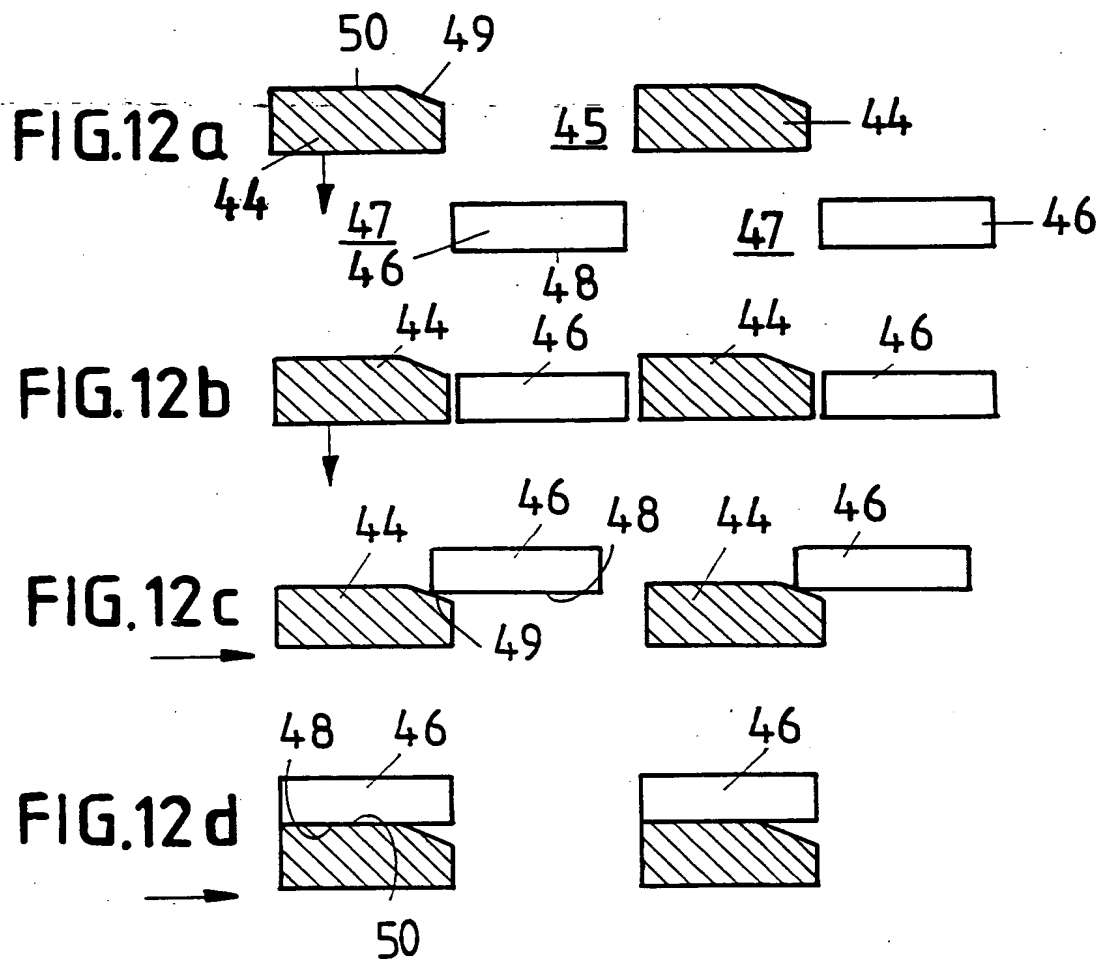


FIG. 9







Tetningsarrangement.

Foreliggende oppfinnelse vedrører et tetningsarrangement omfattende to armaturdeler, som er innrettet til å oppta en tetningsring mellom seg for avtetning av en skjot mellom armaturdelene, og en kleminnretning, som under mon-
5 tasje er innrettet til å klemme armaturdelene mot hverandre i retning mot den mellomliggende tetningsring, hvor tetningsringen har stort sett T-formet ringtverrsnitt, med en radialt utad løpende stamme og med radialt utad vendende tetningsflate i hver av to fra T-formens stamme i motsatte
10 retninger aksialt utadragende tetningsvinger, og hvor tetningsvingene har innbyrdes motsvarende form og motsvarende konusformet tetningsflate for å danne anlegg mot hver sin konusformede støtteflate i hver sin armaturdel.

Den foreliggende oppfinnelse finner sin anvendelse på
15 en rekke forskjellige bruksområder, dvs. såvel under moderate arbeidsbetingelser som under ekstreme arbeidsbetingelser.

Det er heri benyttet uttrykket «armaturdeler» for å markere at det er tale om forskjellige typer «armatur». I
20 det foreliggende utførelseseksempel er oppfinnelsen imidlertid illustrert i forbindelse med en armatur i form av en rørkobling.

Under moderate arbeidsbetingelser kan det for eksempel benyttes ~~en~~ tetningsring av stiv plast eller annet egnet
25 materiale, mens det under ekstreme arbeidsbetingelser, eksempelvis i en rørkobling, kan det ifølge det viste utførelseseksempel benyttes en metallisk tetningsring.

Det er vanlig kjent å benytte en metallisk tetningsring med T-formet ringtverrsnitt i et mellomrom mellom to

motstående koblingsstykker i en rørkobling. Slik rørkobling kan brukes eksempelvis når det opptrer høye trykk- og strekkbelastninger aksialt i rørkoblingen og når det samtidig kan opptre ekstreme innvendige mediumtrykk i skjøten mellom koblingsstykkene/armaturdelene. I det etterfølgende vil «koblingsstykke» bli angitt som -armaturdel.

Et eksempel på slik kjent løsning er vist i NO 178 388. Det er deri vist at T-formens stamme er klempt sammen via motstående sideflater, regnet i rørkoblingens aksialretning, samtidig som T-formens sideveis rettede tetningsfliker via hver sin konusflate er klempt i rørkoblingens aksialretning og radialretning til tetningsanlegg mot en respektiv konusflate i et mothold i en respektiv armaturdel.

Ved å klemme sammen T-formens stamme i aksial retning er tetningsringen låst på plass i tilsiktet bruksstilling, dvs. i en tilsiktet ubevegelig brukstilstand. Ved samtidig lokalisering av tetningsflikene i et tetningsanlegg mot armaturdelene, er tetningen nøyaktig fastlagt i den ubevegelige bruksstilling. Den metalliske tetningsring blir følgelig fastlåst i et ubevegelig inngrep med de respektive armaturdeler.

Ifølge NO 178 388 blir den metalliske tetningsring under montasje underkastet et ekstremt høyt klemtrykk, slik at tetningsringen blir permanent deformert, dvs. ved hjelp av et klemtrykk som medfører overskridelse av metallens flytegrense. Herunder blir den metalliske tetningsring permanent deformert både i aksial og i radial retning. Under bruk i en rørledning hindres følgelig enhver relativ bevegelse mellom tetningsringen og de tilstøtende armaturdeler, uavhengig av hvilke strekk- eller trykkrefter som virker aksialt gjennom rørkoblingen. I praksis vil tetningsringens funksjon helt avhenge av at tetningsringen og armaturdelene hele tiden holdes i permanent klemning med hverandre under et vedvarende høyt klemtrykk. Denne funksjon er sikret så lenge det opprettholdes den ekstremt høye klemkraft. Ved avlastning av det ekstremt høye klemtrykk som er påtrykket rørkoblingen gjøres tetningsfunk-

sjonen uvirksom. Dette medfører, under bruk, ved opp-
tredende ekstreme belastninger aksialt gjennom armatur-
delene, i kombinasjon med varierende ekstremt høye inn-
vendige mediumtrykk og/eller betydelige temperaturvaria-
5 sjoner i koblingsstykkene og tetningsringen, at det oppstår
brudd på tetningen, med derav følgende lekkasje og behov
for reparasjon. Reparasjonen, som nødvendiggjør kassering
av den permanent deformerte tetningsring, henholdsvis even-
tuell skade, som er påført koblingsstykkene, er temmelig
10 arbeidskrevende og temmelig kostbar. Dette er spesielt til-
felle ved bruk i en rørledning som anvendes i en boreopera-
sjon og/eller i forbindelse med opphenting av gass-/olje-
produkter fra brønner i havdypet.

I NO 303150 er det foreslått et tetningsarrangement
15 for ovennevnte formål, dvs. til bruk under ekstreme bruks-
forhold i rørledning med tilhørende rørkobling. I tetnings-
arrangementet er det utelatt ovennevnte metalliske
tetningsring. Istedenfor er det benyttet to armaturdeler
(koblingsstykker), som danner direkte tetningsanlegg mot
20 hverandre i et innbyrdes glideanlegg via en konusformet
tetningsflate i et elastisk ettergivende kransparti i den
ene armaturdel. Det er benyttet en konusformet støtteflate
i et robust støtteparti i den andre armaturdel. Som følge
av det glidbare tetningsinngrep mellom armaturdelene, i
25 kombinasjon med elastisk ettergivende tetningsparti i den
ene armaturdel er det mulig å sikre effektivt tetningsinn-
grep under bruk av rørkoblingen.

Denne tetningseffekt kan oppnås, selv når det opptrer
ekstreme aksiale strekk- og trykk-krefter mellom armatur-
30 delene og selv når det oppstår betydelige temperaturvaria-
sjoner og ekstreme trykkvariasjoner i trykkmediet som
passerer gjennom rørkoblingen. Normalt kan tetningsanord-
ningen ~~gj~~ anvendes etter bruk, dvs. etterat det er av-
lastet den innledningsvis påtrykkede klemkraft.

35 Imidlertid er det, også ifølge NO 303 150, benyttet
meget høye klemtrykk (opp i mot flytegrensen for koblingens
metalliske tetningsparti) under montasje, dvs. under
sammenskyvningen av armaturdelene, og også under selve

bruken av rørkoblingen. Dette er forårsaket av det relativt stive og relativt tykkveggete tetningsparti i det ene koblingsstykke, som skal underkastes elastisk deformasjon.

På grunn av forskjellige belastninger, som opptrer i rørkoblingen under bruk, i kombinasjon med den glidbare tetning som oppnås mellom armaturdelene, er det i den kjente løsning benyttet spesielt høye klemtrykk, dvs. som nevnt klemtrykk av en størrelsesorden like oppunder flytegrensen for det metalliske materiale i armaturdelen med elastisk ettergivende tetningsparti.

I den kjente løsning skal klemtrykket, dvs. det påtrykkede forhåndstrykk, under bruk kunne kompensere for opptredende strekkrefter og derav følgende relative aksiale bevegelser mellom tetningsflaten og motholdsflaten i de to armaturdeler, samtidig som det sikres effektiv avtetning mellom armaturdelene.

Ved eventuell overskridelse av flytegrensen i armaturdelens/-delenes materiale, svikter tetningsfunksjonen mellom armaturdelene. Resultatet er at iallfall armaturdelen med elastisk ettergivende tetningsparti, må skiftes ut.

Ifølge foreliggende oppfinnelse tar man sikte på et tetningsarrangement, som blant annet kan benyttes for samme eller liknende formål, som ifølge NO 303 150, og som med fordel kan erstatte nevnte kjente løsning, basert på et aksialt glidbart tetningsinngrep.

Ifølge oppfinnelsen tar man sikte på å anvende en separat, elastisk ettergivende tetningsring, istedenfor et elastisk ettergivende tetningsparti i den ene armaturdel ifølge NO 303 150.

I ekstreme tilfeller tar man sikte på å kunne utskifte bare selve tetningsringen, på i og for seg kjent måte, ved behov, istedenfor å måtte skifte ut hele armaturdelen med elastisk ~~etter~~tergivende tetningsparti, slik dette er nødvendig ifølge NO 303 150.

I tillegg tar man sikte på å gjøre seg uavhengig av de ifølge den kjente løsning ekstremt høye klemtrykk under montasjen av tetningselementene henholdsvis under bruk av rørkoblingen. Dette innebærer at man kan oppnå effektiv

5 Det tas videre sikte på å kunne benytte vesentlig enklere montasjeteknikk ifølge oppfinnelsen enn ifølge den kjente løsning, i kombinasjon med nevnte vesentlig lavere klemtrykk mot tetningsringen under bruk, enn det som er en forutsetning ifølge NO 303 150.

Tetningsarrangementet ifølge oppfinnelsen er kjenne-
20 tegnet ved at tetningsringens tetningsvinger er elastisk
deformerbare, og at tetningsringen under bruk understøttes
i radial retning i armaturdelene via tre aksialt adskilte,
tilsvarende radialet vendende, ringformede flater, idet
tetningsvingene under bruk danner både glidbar tetning og
25 glidbar avstøtning mot en respektiv konusformet, kombinert
tetnings- og glideflate i hver av armaturdelene, mens
tetningsringens stamme under bruk har et visst pasningsmonn
i aksial retning og er innrettet til å understøttes med
glidepasning mot en tilhørende armaturdel via en midtre,
30 kombinert støtte- og glideflate ved ytterenden av T-formens
stamme.

Ved hjelp av den midtre støtte- og glideflate, som er anordnet ~~den~~ tetningsringstamme, som fortrinnsvis er stiv og formstabil, er det mulig for tetningsringen under bruk å bevege seg uhindret i forhold til hver av armaturdelene, blant annet for utjevning av, dvs. lik fordeling av opptredende tetningstrykk på hver av tetningsvingene. Dette er tilfellet selv under ekstreme brukstilstander (ekstreme

mediumtrykk i koblingen i kombinasjon med ekstreme belastninger på armaturdelene).

Ved hjelp av tetningsringens elastisk deformerbare tetningsvinger i kombinasjon med nevnte formstabile og stive stamme, er det mulig, ved glidebevegelse av tetningsringen i forhold til armaturdelene, å sikre effektiv avtetning i forskjellige aksialt forskjøvne tetningsstillinger, etter behov.

Ved hjelp av den stive stamme kan man sikre en effektiv avstivning av tetningsringens midtre hovedparti. Ved hjelp av forholdsvis slanke tetningsvinger kan man oppnå en elastisk deformasjon av tetningsvingene på forholdsvis enkel måte, selv om tetningsringen er fremstillet av temmelig stivt materiale, så som metall, glass eller stiv plast.

Ifølge oppfinnelsen er det foretrukket å fremstille tetningsringen av samme materiale som armaturdelene, eksempelvis av metall, så som aluminium, eller av et materiale, som har samme eller stort sett samme varmeutvidelseskoeffisient som armaturdelenes materiale. Herved er det mulig å underkaste materialet i armaturdelene og materialet i tetningsringen lik eller mest mulig lik utvidelse henholdsvis kontraksjon ved varierende temperatur- og trykkforhold.

Ytterligere trekk ved tetningsarrangementet ifølge oppfinnelsen vil fremgå av den etterfølgende beskrivelse under henvisning til de medfølgende tegninger, hvori:

Fig. 1 viser et tetningsarrangement ifølge oppfinnelsen anvendt i forbindelse med en armatur i form av en rørkobling, vist delvis i sideriss og delvis i lengdesnitt.

Fig. 1a viser et utsnitt av to armaturdeler i sammen-skjøvet posisjon.

Fig. 2 viser det samme som i fig. 1, vist i perspektiv og dels i sideriss og dels i lengdesnitt.

Fig. 3 viser i lengdesnitt en første armaturdel.

Fig. 4 viser i perspektiv en andre armaturdel.

Fig. 5 viser i lengdesnitt en klemdel.

Fig. 5a viser klemdelen ifølge fig. 5 i planriss.

Fig. 6 viser en tetningsring, vist dels i sideriss og dels i lengderiss.

Fig. 7 og 8 viser tetningsringen ifølge fig. 6 i planriss henholdsvis i perspektivriss.

5 Fig. 9 viser et utsnitt av fig. 6 i større målestokk.

Fig. 10 illustrerer tetningsarrangementet ifølge oppfinnelsen forut for sammenskjøting, vist i en alternativ utførelse.

10 Fig. 11 illustrerer tetningsarrangementet ifølge fig. 10 etter sammenskjøting.

Fig. 12a-12d viser skjematisk fire forskjellige stadier av en aksial sammenklemming av armaturdelene, vist med et par klemorganer i den ene armaturdel og et par klemorganer i kleminnretningens klemdel.

15 Et tetningsarrangement 10 ifølge oppfinnelsen omfatter, slik som vist i fig. 1, en første armaturdel 11 og en andre armaturdel 12 samt en ringformet tetningsring 13. I tillegg benyttes det i tetningsarrangementet 10 en kombinert klem- og låseinnretning 30, som skal beskrives nærmere
20 lengre nedenfor i beskrivelsen.

Tetningsarrangementet 10 ifølge oppfinnelsen kan benyttes for forskjellige typer armaturdeler, så som rør, slanger, ledninger, beholdere, dekseldeler, m.m.

I et første utførelseseksempel, ifølge fig. 1-9, er
25 tetningsarrangementet 10 vist i forbindelse med en armatur, som er i form av en rørkobling. Istedenfor å betegne delene som «rørdeler», benyttes det heri, som nevnt ovenfor, generelt begrepet -armaturdeler-, for derved å presisere at det kan benyttes andre deler istedenfor de heri viste
30 rørdeler eller koblingsstykker.

Tetningsarrangementet 10 kan anvendes for vilkårlige tetningsformål, med forskjellige krav til tetningstrykk og med forskjellige krav til variasjoner i tetningstrykk og forskjellige krav til variasjoner i temperaturforhold.

35 Tetningsarrangementet 10 er i prinsippet anvendbar såvel for innvendig avtetning for å hindre lekkasje av medium innenfra og utad, som for utvendig avtetning for å hindre lekkasje av medium utenfra og innad. I det viste

utførelseseksempel er det imidlertid bare vist en utførelse for innvendig avtetting.

Eventuelt kan det benyttes en første, radialt indre tetningsring mot innvendige overtrykk og en andre, radialt ytre tetningsring mot utvendige overtrykk, idet hver tetningsring er basert på tetningsarrangementet ifølge foreliggende oppfinnelse.

Tetningsarrangementet 10 kan spesielt anvendes for utstyr som kan utsettes for betydelige variasjoner i innvendige og i utvendige mediumtrykk og/eller for betydelige variasjoner i utvendige og innvendige temperaturforhold. Løsningen skal eksempelvis kunne anvendes under temperaturvariasjoner på 40-50°C eller mere. Det tenkes i denne forbindelse spesielt på anvendelse i ørkenområder med ekstremt høye dagtemperaturer og temmelig lave nattertemperaturer. Videre tenkes det på anvendelse i arktiske eller liknende kalde anvendelsesområder, hvor det ved visse årstider kan opptre ekstremt lave temperaturer.

Tetningsarrangementets T-formede, relativt stive og relativt formstabile tetningsring 13 kan være fremstillet av stort sett vilkårlig, forholdsvis stivt materiale, så som metall, plast, glass eller liknende. Fortrinnsvis er tetningsringen 13 fremstillet av samme materiale som armaturdelen 11,12 eller av et materiale med lik eller stort sett tilsvarende varmeutvidelseskoeffisient.

De nevnte fire deler 11,12,13,30 har en felles lengdeakse 10a. Tre deler 11-13 har hver sin innbyrdes fluktende, sylindriske innerflate 11a,12a,13a. Låseinnretningen 30 er anordnet radialt like utenfor armaturdelen 11,12 i et område der disse overlapper hverandre.

Tetningsringen 13 er, som vist i fig. 1 i bruksklar tilstand, opptatt i et nedadåpnende leie 11b (se fig. 1a) i den ene armaturdelen 11. Leiet 11b er avgrenset mellom en første, radialt løpende, aksialt vendende, innerste styreflate 19 og en andre, radialt løpende, aksialt vendende, ytterste styreflate 20 og en mellomliggende, mothold dannende konusflate 21 samt en radialt vendende sylindrisk, ytterst liggende støtteflate 22. Konusflaten 21

forløper under en konusvinkel α i forhold til tetningsarrangementets 10 lengdeakse 10a.

Armaturdelen 12 er, som vist i fig. 1a, utstyrt med et oppad åpnende leie 12b, som omfatter en første, radialt løpende, aksialt vendende, innerste styreflate 23 og en andre, radialt løpende, aksialt vendende, ytterste styreflate 24 og en mellomliggende, mothold dannende konusflate 25, som løper motsvarende under en konusvinkel α i forhold til lengdeaksen 10a.

10 Som vist i fig. 1 og 1a har armaturdelen 11 et skjørtparti 26, som overlapper et omkretsparti 27 på armaturdelen 12 i et område aksialt innenfor armaturdelens 12 endeflate 23.

15 Armaturdelene 11 og 12 er utstyrt med to par motsvarende sylindriske ledeflater 26a, 27a henholdsvis 26b, 27b med innbyrdes avpasset pasningsmonn. Armaturdelene 11, 12 danner innbyrdes støtteanlegg via konusformede stopperflater 26c, 27c i et overgangsparti mellom parene av ledeflater 26a, 27a; 26b, 27b. I sammenskjøvet tilstand avsperrers 20 armaturdelene 11, 12 med innbyrdes støtte i aksial retning via stopperflatene 26c, 27c. Etter montasje ved hjelp av kleminnretningen 30 avsperrers armaturdelene 11, 12 i motsatt aksial retning.

I fig. 1 og 2 er tetningsarrangementets 10 kleminnretning 30 vist utformet med en hylseformet klemdel 31, 25 som er dreibart lagret via et krageparti 32, som rager innad i et ringspor 33 på armaturdelen 11. Ringsporet 33 er avgrenset mellom et skulderparti 34 på armaturdelen 11 og en todelt, stopperdannende ring 35, som er lokalt festet 30 til armaturdelen 11 via radialt løpende festeorganer 36.

Klemdelens 31 endeflate 31a er i tetningsarrangementets bruksstilling avsluttet tett opp til en aksialt vendende sideflate 37a i en todelt, stopperdannende ring 37, som er lokalt festet til den andre armaturdel 12 i et 35 tilhørende ringspor 38 via radialt løpende festeorganer (ikke nærmere vist).

Langs klemdelens 31 nedre ytterside er det festet en dekseldel 39 via radialt løpende festeorganer 40. Ved hjelp

av dekseldelen 39 kan det avtettes en spalte 41 mellom klemdelen 31 og ringen 37. Langs klemdelens 31 øvre ytter-side er det til klemdelen 31 festet et hylseformet hånd-grepsparti 42 med radialt utadragende fremspring 43.

5 På klemdelens 31 innerside (se fig. 5) er det nederst anordnet en rekke (heri vist fire) radialt innad ragende klemorganer 44, som er innbyrdes adskilte med et til-svarende antall (fire) mellomrom 45.

10 På armaturdelens 12 ytterside (se fig.4) rager det radialt utad en rekke (fire) innbyrdes adskilte klem-organer 46, som er innbyrdes adskilte med (fire) mellomrom 47.

15 Klemorganene 44 er i det viste utførelseseksempel utstyrt med en aksialt vendende, radialt løpende, lang-strakt og plan klemflate 48.

20 Klemorganene 46 er på sin motsvarende, aksialt vendende klemflate utstyrt med en motsvarende aksialt vendende, radialt løpende, langstrakt og plan klemflate. I praksis og slik som vist i fig. 12a-12d omfatter sistnevnte klemflate en forholdsvis kort, radialt løpende kileflate 49 og en etterfølgende, vesentlig lengre, radialt løpende støtteflate 50.

25 Ved tetningsringer av stål, aluminium eller annet metall benyttes fortrinnsvis mekaniske (ikke nærmere viste) kleminnretninger i forbindelse med selve den aksiale sammenklemming av armaturdelene 11,12, mens det i tillegg benyttes kleminnretningen 30 for å dreie klemorganene 44,46 (se fig. 12a-12d) på plass i innbyrdes låsestilling (fig. 12d).

30 I et annet tilfelle, hvor det eksempelvis brukes tetningsringer av plast, kan man benytte kleminnretningen 30 både til aksial sammenklemming av armaturdelene 11,12 og til sammenlåsing av klemorganene 44,46. I sistnevnte til-felle er kileflaten 49 benyttet i forbindelse med sammen-35 klemmingen av armaturdelene 11,12.

I en innledende fase av sammenkoblingen av armatur-delene 11,12 (se fig. 12a) dreies klemdelen 31 i forhold til armaturdelene 11,12 om akselen 10a, slik at dens klem-

organer 44 kan skyves aksialt innad i mellomrommene 47 mellom armaturdelens 12 klemorganer 46.

Deretter skyves armaturdelen 12 aksialt innad i armaturdelen 11 og dennes klemdel 31, slik som antydnet med
5 en pil A i fig. 12b.

Klemdelen 31 dreies deretter, slik som vist med en pil B i fig. 12c, til den posisjon som er vist i fig. 12d. Ved hjelp av kileflaten 49 tvinges armaturdelene 11,12 aksialt sammen fra en posisjon tilsvarende som vist i fig. 10 til
10 en posisjon som vist i fig. 11.

I sistnevnte posisjon sikres armaturdelens 12 klemorganer 46 og klemdelens 31 klemorganer 44 i et innbyrdes sperreinngrep via de plane klemflatene 48,50. Samtidig støter armaturdelene 11,12 aksialt sammen via stopper-
15 flatene 26c,27c.

Herved sikres delene 11,12,31 aksialt på plass i forhold til hverandre, mens det avgrenses et pasningsmonn eller annen avpasset avstand mellom stammens 14 respektive sideflate 14b, 14c og armaturdelenes 11,12 motstående
20 styreflater 20,23.

Man sikrer herved en justering av stammens 14 posisjon i forhold til leiet 11b og leiet 12b i aksial retning, mens tetningsflatene 15a og 16a sentreres tilsvarende i aksial retning på plass i forhold til de koniske støtteflater
25 21,25 i armaturdelene 11,12.

I det viste utførelseseksempel danner tetningsringen 13 direkte anlegg bare mot armaturdelens 11 konusformede støtteflate 21 og mot armaturdelens 12 konusformede støtte-
30 flate 25. Tetningsringen 13 har pasningsmonn eller en større eller mindre avstand fra motstående flater 19,20,22 i leiet 11b i armaturdelen 11 henholdsvis fra styreflaten 23 i leiet 12b i armaturdelen 12.

Tetningsringen 13, som vist separat i fig. 6-9, har et stort sett T-formet tverrsnitt med en midtre stamme 14 og
35 to sidevinger 15,16. Sidevingene 15,16 er innbyrdes forbundet via tetningsringens 13 midtre stamme 14 i og ved innerflaten 13a.

Stammen 14 er motsatt innerflaten 13a, utstyrt med en sylindrisk omkretsflate/endeflate 14a. Endeflaten 14a er innrettet til å danne en glidbar støtteflate for tetningsringen 13 langs dennes omkrets via armaturdelens 11 støtte-

5 flate 22.

I det viste utførelseseksempel er tetningsringens sylindriske endeflate 14a utstyrt med et sentralt ringspor 17, som er beregnet til å oppta en elastisk ettergivende O-ring 18, som rager radially like utenfor endeflaten 14a. O-

10 ringen 18 kan anvendes som tetningsringens 13 gliderdel under montasje i armaturen og spesielt til fastholdelse av tetningsringen 13 i en delvis innskjøvet tilstand, særlig ved montasje av tetningsringen 13 nedenfra og oppad i armaturdelens 11 nedadåpnende leie 11b.

15 Stammen 14, som har stort sett rektangelformet, stivt og massivt tverrsnitt, har fra hver sin endekant av den sylindriske endeflate 14a en radially løpende, aksialt vendende sideflate 14b henholdsvis 14c. I praksis er sideflaten 14b anordnet i en viss avstand fra den motstående

20 styreflate 20 i armaturdelen 11. Tilsvarende er sideflaten 14b anordnet i en viss avstand fra dennes motstående styreflate 24. Avstanden mellom hvert par sideflate/styreflate kan være minimal, dvs i størrelsesorden pasningsmonn eller i en viss avstand, eksempelvis 1-3 mm ved tetningsringer

25 med forholdsvis stor diameter.

Fra stammens 14 ene sideflate 14b rager det sideveis utad en første tetningsflate i form av en konusflate 15a i den ene sidevinge 15. Fra den andre sideflate 14c rager det sideveis utad i motsatt retning en andre tetningsflate i

30 form av en konusflate 16a i den andre sidevinge 16. Tetningsringens 13 tetningsdannende konusflater 15a og 16a har motsvarende dimensjoner og er utformet symmetrisk i forhold til stammen 14.

I det viste utførelseseksempel kan tetningsringens 13

35 tetningsflater 15a, 16a ha samme eller stort sett samme konusvinkel α som armaturdelenes 11, 12 respektivt motstående støtteflate 21, 25. I et slikt tilfelle oppnår man effektiv avtetning ved moderat aksial forskyvning av

tetningsringens 13 tetningsvinger 15,16 langs armaturdelenes 11,12 støtteflater 21,25 under utøvelse av et betydelig radialet tetningstrykk mot støtteflatene 21,25.

Tetningsvingene 15,16 er utstyrt med hver sin radialet løpende, aksialet vendende endeflate 15b,16b. Det er (se fig. 11) vist sidevingenes 15,16 endeflater 15b,16b i en viss aksialet avstand fra styreflatene 19 og 23, slik at tetningsvingene 15,16 kan beveges langs konusflatene 21,25 aksialet en viss distanse frem og tilbake i forhold til flatene 19 og 23 under eventuelt opptredende ekspansjon/kontraksjon i tetningsringens 13 materiale.

Videre er tetningsringen 13 i det viste utførelsesseksempel, i diametralt motstående partier i stammen 14, utstyrt med to aksialet gjennomgående skruegjengebærende borer 17a,17b. Boringene 17a,17b er innrettet til å gjennomløpes av en spindel med skruegjenge motsvarende borer 17a,17b skruegjenge for å kunne tvinge tetningsringens 13 stamme 14 aksialet bort fra den tilstøtende armaturdels støtteflate ved demontering av tetningsringen etter bruk, i tilfeller endeflaten 14a på tetningsringens 13 stamme 14 oppviser for stor friksjon mot armaturdelens 11 sylindriske støtteflate 21.

Ifølge et alternativt utførelsesseksempel (se fig. 10 og 11), som kan benyttes for enkle tetningsarrangementer, men som foretrekkes ved tetningsarrangementer som skal anvendes under høye tetningstrykk eller under andre spesielt krevende tetningsforhold, har en tetningsring 13' en konusvinkel b som er noe større enn konusvinkelen a i armaturdelene 11,12.

Sammenskyvningen av armaturdelene 11,12 omkring den mellomliggende tetningsring 13' kan i dette tilfelle skje på tilsvarende måte som i tilfellet som beskrevet ovenfor. I fig. 10 er tetningsringen 13' vist i en innledende fase av sammenskyvningen mellom armaturdelene 11,12 og i fig. 11 er samme vist etter endt sammenskyvning. Spaltene mellom tetningsringens 13' flater 14b,14c og motstående flater 20,23 i armaturdelene 11,12 er ifølge fig. 11 vist for-

holdsvis store, men kan i praksis være vesentlig smalere, eksempelvis i størrelsesorden pasningsmonn.

I det viste utførelseseksempel danner tetningsringen, på den ene side av stammen 14, tetningsanlegg via
 5 tetningsvingens 15 konusformede tetningsflate 15a mot armaturdelens 11 konusflate 21, mens tetningsringen 13, på den motsatte side av stammen 14, danner tetningsanlegg via tetningsvingens 16 konusformede tetningsflate 16a mot armaturdelens 12 konusflate 25.

10 I visse tilfeller med enkle tetningsarrangementer kan tetningsringens 13 flater 14a, 14b og 15b, 16b danne direkte støtteanlegg mot armaturdelenes 11, 12 motstående flater 19, 20, 22 henholdsvis 23, 24.

I øvrige tilfeller, særlig når det er tale om mere
 15 tilpasningskrevende tetningsarrangementer, kan tetningsringens 13 flater 14a, 14b, 15b henholdsvis 14c og 16b være anordnet i større eller mindre avstand fra nevnte flater 19, 20, 22 henholdsvis 23, 24, etter behov. Dette tilfelle er eksempelvis antydnet i det andre utførelseseksempel ifølge
 20 fig. 10 og 11.

Ifølge fig. 10-11 er det vist et tetningsarrangement 10' ifølge oppfinnelsen med en tetningsring 13' ifølge en alternativ utførelse.

En første avvikelse fra den første utførelse, som er
 25 vist ifølge fig. 1-9, består i at de konusformede tetningsflater 15a' og 16a' forut for montasje danner en konusvinkel b, som avviker fra de konusformede støtteflaters 21, 25 konusvinkel a.

Ved at konusflatene 15a, 16a i utgangspunktet, dvs.
 30 forut for montasje, danner en konusvinkel b, som er noe større enn den motsvarende konusvinkel a i armaturdelene 11, 12, kan tetningsvingene 15 og 16 under selve montasjen deformere seg elastisk i forhold til de konusformede støtteflater 21, 25, slik at tetningsflatene 15a, 16a faller sammen
 35 med armaturdelenes 11, 12 motsvarende konusformede støtteflater 21, 25 under felles konusvinkel a.

Under innsettingen av tetningsringen 13' i armaturdelen 12 danner tetningsflaten 15a i en første innsettings-

fase et minimalt anlegg mot konusflaten 25, mens stammens 14 tilstøtende sideflate 14b danner en betydelig avstand fra den motstående flate 20 i armaturdelen 12.

Ved sammenskyvning av armaturdelen 11 mot armatur-
 5 delen 12 om den mellomliggende tetningsring 13, ved hjelp av kleminnretningen 30, fra den stilling som er vist i fig. 10 til den stilling som er vist i fig. 11, deformeres tetningsringens 13' tetningsvinger 15', 16' på elastisk ettergivende måte mot de konusformede konusflater 21, 25
 10 inntil tetningsflatene 15a', 16a' danner tett anlegg mot konusflatene 21, 25. I en stilling tilsvarende til den som er vist i fig. 1, danner de konusformede tetningsflater 15a, 16a samme konusvinkel α som konusflatene 21, 25 i armaturdelene 11, 12, slik som vist i fig. 11.

15 Ved å sørge for et visst pasningsmonn mellom tetningsringens 13' endeflate 14a og armaturdelens 11 støtteflate 22 kan man sikre at tetningsringens stamme 14 kan foreta en viss aksial justering om nødvendig og sentreres på plass i en midtre stilling mellom armaturdelene 11, 12, slik som
 20 illustrert i fig. 11. I denne anledning kan man, uten at dette er spesielt vist på tegningen, benytte større eller mindre rom mellom flatene 14b, 22 og mellom flatene 14c, 24, etter behov.

Ved utførelsen ifølge fig. 10 og 11 har man, som en
 25 ekstra, alternativ mulighet, sørget for at tetningsvingenes 15', 16' respektive andel av tetningsflaten 13a' forut for montasje har et konusformet forløp under en konusvinkel β , slik at nevnte andeler av tetningsflaten 13a' etter montasje, dvs. etterat tetningsvingene 15', 16' er
 30 elastisk deformert i forhold til støtteflatene 21, 25 får et fluktende forløp med armaturdelenes 11, 12 ledeflater 11a, 12a.

I utførelsen ifølge fig. 10 og 11 benyttes det et
 endeveis støtteanlegg mellom armaturdelene 11, 12 via
 35 radialt løpende støtteflater 20', 25' istedenfor støtteanlegget mellom konusflatene 26c, 27c i det første utførelseseksempel.

P A T E N T K R A V .

1. Tetningsarrangement (10,10') omfattende to armatur-
deler (11,12), som er innrettet til å oppta en tetningsring
5 (13,13') mellom seg for avtetning av en skjøt mellom
armaturdelene (11,12), og en kleminnretning (30), som under
montasje er innrettet til å klemme armaturdelene (11,12)
mot hverandre i retning mot den mellomliggende tetningsring
(13,13'), hvor tetningsringen (13,13') har stort sett T-
10 formet ringtverrsnitt, med en radialt utad løpende stamme
(14) og med radialt utad vendende tetningsflate (15a,15b) i
hver av to fra T-formens stamme (14) i motsatte retninger
aksialt utadragende tetningsvinger (15,16), idet tetnings-
vingene (15,16) har innbyrdes motsvarende form og motsva-
15 rende konusformet tetningsflate (15a,16a) for å danne
anlegg mot hver sin konusformede støtteflate (21,25) i hver
av armaturdelene (11,12), k a r a k t e r i s e r t v e d
at tetningsringens (13,13') tetningsvinger (15,16) er
elastisk deformerbare, og
20 at tetningsringen (13,13') under bruk understøttes i
radial retning i armaturdelene (11,12) via tre aksialt
adskilte, tilsvarende radialt vendende, ringformede flater
(21,22,25),
idet tetningsvingene (15,16) under bruk danner både
25 glidbar tetning og glidbar avstøtning mot en respektiv
konusformet, kombinert tetnings- og glideflate (21,25) i
hver av armaturdelene (11,12),
mens tetningsringens (13,13') stamme (14) under bruk
har et visst pasningsmonn i aksial retning og er innrettet
30 til å understøttes med glidepasning mot en tilhørende
armaturdel via en midtre, kombinert støtte- og glideflate
(22) ved ytterenden av T-formens stamme (14).

2. Kobling i samsvar med krav 1, k a r a k t e r i -
35 s e r t v e d

at den midtre støtteflate (22) er anordnet i den ene
armaturdel (11), og

at de to øvrige støtteflater (21,25) er anordnet i hver sin armaturdel (11,12).

3. Kobling i samsvar med krav 1 eller 2, k a r a k -
5 t e r i s e r t v e d

at armaturdelenes (11,12) konusformede støtteflater har en første, minste konusvinkel (a), og

at tetningsvingenes (15,16) konusformede tetnings-
flater (15a,16a), forut for montasje, har en andre, noe
10 større konusvinkel (b) og etter montasje har samme konus-
vinkel (a) som de konusformede støtteflater (21,25), og

at tetningsvingenes (15,16) tetningsflater (15a,16a) sikrer avtetning mellom tetningsringen (13,13') og armaturdelene (11,12) under bruk under en eventuell relativ
15 bevegelse aksialt langs armaturdelenes (11,12) respektive konusformede støtteflate (21,25) over en bevegelseslengde på mellom 0,5 og 2,5 mm eller over en lengde på omtrent 30% av den konusformede støtteflates (21,25) lengde.

20 4. Kobling i samsvar med et av kravene 1-3,
k a r a k t e r i s e r t v e d

at armaturdelene (11,12), under bruk, danner innbyrdes støtte via innbyrdes motstående, stopper dannende konus-
flater (26c,27c), og

25 at tetningsringens (13,13') stamme (14), tilsvarende under bruk, avspærres med moderat pasningsmonn mellom armaturdelene (11,12), for å tillate en viss moderat bevegelse av tetningsringen (13,13') i aksial retning i forhold til armaturdelene (11,12).

30

5. Kobling i samsvar med et av kravene 1-4, k a r a k -
t e r i s e r t v e d

at ~~tetnings~~ringens (13,13') stamme (14) har relativt stort tverrsnitt og stor stivhet,

35 og at tetningsringens (13,13') to tetningsvinger (15,16) har relativt mindre tverrsnitt og mindre stivhet.

6. Kobling i samsvar med et av kravene 1-5,
k a r a k t e r i s e r t v e d

- 5 at tetningsringen (13,13') er fremstillet av samme materiale som armaturdelene (11,12), eksempelvis av metall, så som aluminium, eller er fremstillet av materiale, som har samme eller stort sett samme varmeutvidelseskoeffisient som armaturdelenes (11,12) materiale.

Sammendrag.

Det omtales et tetningsarrangement (10,10') omfattende to armaturdeler (11,12), som er innrettet til å oppta en
5 tetningsring (13,13') mellom seg for avtetning av en skjøl mellom armaturdelene (11,12), og en kleminnretning (30), som under montasje er innrettet til å klemme armaturdelene (11,12) mot hverandre i retning mot den mellomliggende tetningsring (13,13'), hvor tetningsringen (13,13') har
10 stort sett T-formet ringtverrsnitt, med en radiallyt utad løpende stamme (14) og med radiallyt utad vendende tetningsflate (15a,15b) i hver av to fra T-formens stamme (14) i motsatte retninger aksialt utadragende tetningsvinger (15,16), idet tetningsvingene (15,16) har innbyrdes motsvarende form og motsvarende konusformet tetningsflate
15 (15a,16a) for å danne anlegg mot hver sin konusformede støtteflate (21,25) i hver av armaturdelene (11,12).

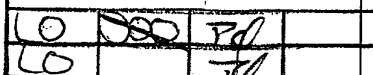
Tetningsarrangementet er kjennetegnet ved at tetningsringens (13,13') tetningsvinger (15,16) er elastisk
20 deformerbare, og at tetningsringen (13,13') under bruk understøttes i radial retning i armaturdelene (11,12) via tre aksialt adskilte, tilsvarende radiallyt vendende, ringformede flater (21,22,25), idet tetningsvingene (15,16) under bruk danner både glidbar tetning og glidbar avstøtning mot en respektiv konusformet, kombinert tetnings- og
25 glideflate (21,25) i hver av armaturdelene (11,12), mens tetningsringens (13,13') stamme (14) under bruk har et visst pasningsmonn i aksial retning og er innrettet til å understøttes med glidepasning mot en tilhørende armaturdel
30 via en midtre, kombinert støtte- og glideflate (22) ved ytterenden av T-formens stamme (14).

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

OMBERG, J., O.
AS BERGEN PATENTKONTOR
C. Sundtsgt. 36
N-5004 Bergen
NORVEGE

AS BERGEN
PATENTKONTOR
27 OKT. 2000



FRIST FØRT 24. des. 00

PCT

FRIST FØRT 24. jan. 01
WRITTEN OPINION

(PCT Rule 66)

Date of mailing
(day/month/year)

24.10.2000

Applicant's or agent's file reference
JOO/iek

REPLY DUE

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F16L23/18

Applicant

DEN NORSKE METALLPAKNINGSFBRIKK AS et al

1. This written opinion is the **first** drawn up by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain document cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

3. The applicant is hereby **invited to reply** to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

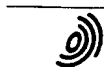
How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also: For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 28/05/2001.

Name and mailing address of the international preliminary examining authority:



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Formalities officer (incl. extension of time limits)

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VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: AT 392 143 B

D2: DE 37 23 386 A

1- Novelty

The subject matter of claims 1, 3, 4, 5 lacks novelty (Art. 33.2 PCT) because their features are known from D1.

1-1 Claim 1:

From D1, a sealing arrangement is known. It comprises two armature members (1, 2, Fig.1) which are adapted to receive a sealing ring (7, Fig.1) between them for sealing off a joint between the armature members, and a clamping device (17, Fig.3), which during mounting is adapted to clamp the armature members (15, 16 Fig.3) against each other in a direction towards the intermediate sealing ring. The sealing ring has a substantially T-shaped annular cross section, with a stem extending radially outwards and with a sealing face facing radially outwards in each of two sealing wings projecting axially outwards in opposite directions from stem of the T-shape. The sealing wings have mutually equivalent forms and equivalent conical sealing faces (9 Fig.1) for forming abutments against their respective conical support faces (5, Fig.1) of each of the armature members.

Furthermore, the sealing wings of the sealing ring are elastically deformable (page 2, line 5), and during use the sealing ring is supported in a radial direction in the armature members via three axial separated, annular faces (8, 9, 9) facing radially correspondingly. The sealing wings form during use both slidable sealing and slidable thrust against a respective conical, combined sealing and slide face (5, 5) of each of the armature members. The stem of the sealing ring has during use a certain degree of fit in axial direction and is adapted to be supported with a sliding fit against an associated armature member via a middle, combined support and slide face (Ringkammer 4, page 3, line 15) at the outer end of stem of the T - shape.

1-2 Claim 3:

The coupling of D1 has conical support faces of the armature members which have a first, smallest cone angle than that of the sealing faces of the sealing wings have, prior to mounting (page 3, lines 19-20). After mounting, the angles match one another (Fig.3). The sealing faces ensure sealing between the sealing ring and the armature members during use, and during a possible relative movement axially along respective conical support faces of the armature members over a length of movement of between 0.5 and 2.5 mm, allowed by the play in the chamber (Ringkammer 4).

1-3 Claim 4:

The armature members of the coupling of D1 form a mutual support via mutually opposite, stop - forming cone faces (Fig.3). The stem of the sealing ring is closed off, during use, with a moderate degree of fit between the armature members, in order to permit a certain moderate movement of the sealing ring in an axial direction relative to the armature members, due to the axial play in the Ringkammer (4).

1-4 Claim 5:

The coupling of D1 has a stem of its sealing ring which may have a relatively large cross-section and large rigidity, and two sealing wings which have a relatively smaller cross-section and smaller rigidity, due to their less important thickness.

2- Inventive step

The subject matter of claims 2, 6 would appear to lack an inventive step (Art. 33.3 PCT) for the following reasons:

2-1 Claim 2:

D2 discloses a coupling in which the middle support face is arranged in the one armature member (Fig.3), and where the two remaining support faces (external sides of elements 62, 63, Fig.3) are arranged each in their respective armature member. The application of the arrangement mentioned in D2 to that disclosed in D1 would lead to an apparatus

having all the features claimed in claim 2. Such a practice would be obvious for the skilled person wanting to ease the assembly of the 2 armature members so that the joint remains in place during the mounting operation, especially when the armature members have to be mounted vertically.

2-2 Claim 6:

Although not ruled out by D1, the features of claim 6 of the present application may also result from the combination of D1 and D2. The coupling of D2 has indeed a sealing ring made of the same material as the armature members (Page 6, lines 17-27), which thus has the same or substantially the same coefficient of heat expansion as the material of the armature members. The solving of the corrosion problem mentioned in D2 (page 6, line 25) would lead the skilled person to apply this feature to the coupling according to D1, therefore leading to a coupling having all the features mentioned in the claim 6 of the present application.

Re Item VII

Certain defects in the international application

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D2 is not mentioned in the description, nor are these documents identified therein.

Re Item VIII

Certain observations on the international application

1- Figures:

The reference 18 is missing on Fig.9.

2- Claim 3:

Claim 3 do not meet the requirements of Article 6 PCT in that the matter for which protection is sought is defined in vague terms, the claim attempting to define the subject-matter in terms of the result to be achieved. In particular, the technical features which are

**WRITTEN OPINION
SEPARATE SHEET**

International application No. PCT/NO00/00017

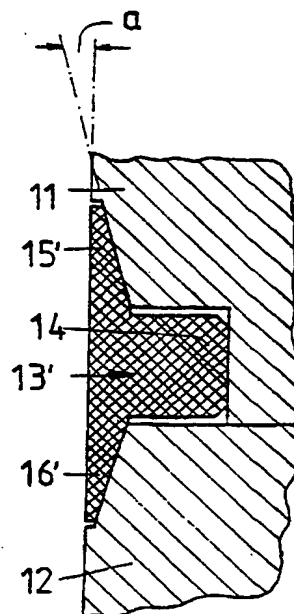
necessary for achieving the sealing along with an axial movement, are not present in the claims and should be added in the characterising part of this claim.

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷: F16L 23/18	A1	(11) International Publication Number: WO 00/47925 (43) International Publication Date: 17 August 2000 (17.08.00)
(21) International Application Number: PCT/NO00/00017 (22) International Filing Date: 26 January 2000 (26.01.00) (30) Priority Data: 19990388 28 January 1999 (28.01.99) NO (71) Applicant (for all designated States except US): DEN NORSKE METALLPAKNINGSFABRIKK AS [NO/NO]; Skuteviksvei 30, N-5035 Bergen (NO). (72) Inventor; and (75) Inventor/Applicant (for US only): HJERTHOLM, Ole [NO/NO]; Lepsøyeneset, N-5228 Lepsøy (NO). (74) Agent: AS BERGEN PATENTKONTOR; C. Sundtsgt. 36, N-5004 Bergen (NO).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>In English translation (filed in Norwegian).</i>

(54) Title: SEALING ARRANGEMENT**(57) Abstract**

There is referred to a sealing arrangement (10, 10') comprising two armature members (11, 12), which are adapted to receive a sealing ring (13, 13') between them for sealing off a joint between the armature members (11, 12), and a clamping device (30), which during mounting is adapted to clamp the armature members (11, 12) against each other in a direction towards the intermediate sealing ring (13, 13'), where the sealing ring (13, 13') has a substantially T-shaped annular cross-section, with a stem (14) extending radially outwards and with a sealing face (15a, 15b) facing radially outwards in each of two sealing wings (15, 16) projecting axially outwards in opposite directions from stem (14) of the T-shape, the sealing wings (15, 16) having mutually equivalent forms and equivalent conical sealing faces (15a, 16a) for forming abutments against their respective conical support faces (21, 25) of each of the armature members (11, 12). The sealing arrangement is characterised in that the sealing wings (15, 16) of the sealing ring (13, 13') are elastically deformable, and that the sealing ring (13, 13') is supported, during use, in a radial direction in the armature members (11, 12) via three axially separated, annular faces (21, 22, 25) facing radially correspondingly, the sealing wings (15, 16) forming, during use, both slidable seals and slidable thrusts against a respective conical, combined sealing and slide face (21, 25) of each of the armature members (11, 12), while stem (14) of the sealing ring (13, 13') has, during use, a certain degree of fit in an axial direction and is adapted to be supported with a slide fit against an associated armature member via a middle, combined support and slide face (22) at the outer end of the stem (14) of the T-shape.



Sealing Arrangement

Present invention relates to a sealing arrangement comprising two armature members, which are adapted to receive a sealing ring between them for sealing off a joint between the armature members, and a clamping device, which during mounting is adapted to clamp the armature members against each other in a direction towards the intermediate sealing ring, where the sealing ring has a substantially T - shaped annular cross-section, with a stem extending radially outwards and with a seal face facing radially outwards in each of two sealing wings projecting axially outwards in opposite directions from the stem of the T - shape, and where the sealing wings have a mutually equivalent form and equivalent conical seal faces for forming abutments against their respective conical support faces of each respective armature member.

The present invention finds its application in a series of different areas of use, that is to say during moderate working conditions as well as during extreme working conditions.

The expression " armature members " is employed herein for indicating that there are under discussion various types of " armature ". In the present embodiment however the invention is illustrated in connection with an armature in the form of a pipe coupling.

During moderate working conditions there can be employed for example a sealing ring of rigid plastic or another suitable material, while under extreme working conditions, for example in a pipe coupling, there can be employed according to the illustrated embodiment a
5 metallic sealing ring.

It is generally known to employ a metallic sealing ring of T - shaped annular cross-section in an intermediate space between two opposite coupling pieces of
10 a pipe coupling. Such a pipe coupling can be used for example when high pressure and tensile loadings occur axially in the pipe coupling and when at the same time extreme internal medium pressure can occur in the joint between the coupling pieces/the armature members. In what
15 follows " coupling piece " will be indicated as armature member.

An example of such a known solution is shown in NO 178 388. Therein it is shown that the stem of the T-shape is clamped together via opposite side faces, in the axial
20 direction of the pipe coupling, at the same time as laterally directed sealing flaps of the T-shape are clamped each via its cone face in the axial direction and radial direction of the pipe coupling for sealing abutment against a respective cone face of a stopper of a
25 respective armature member.

By clamping together the stem of the T-shape in the axial direction the sealing ring is locked in place in the intended use position, that is to say in an intended immovable use position. At the same time by arrangement of
30 the sealing flaps in a sealing abutment against the

armature members, the seal is precisely set in the immovable use position. Consequently the metallic sealing ring becomes locked in an immovable engagement with the respective armature members.

5 According to NO 178 388 the metallic sealing ring becomes subjected, during mounting, to an extremely high clamping pressure, so that the sealing ring becomes permanently deformed, that is to say by means of a clamping pressure which involves exceeding the yield
10 strength of the metal. The metallic sealing ring becomes permanently deformed both in an axial and in a radial direction. During use in a pipe conduit any relative movement between the sealing ring and the adjacent armature members is consequently prevented, independently
15 of which tensile or pressure forces which have an effect axially through the pipe coupling. In practice the function of the sealing ring will depend totally upon the sealing ring and the armature members being held the whole time in permanent clamping engagement with each other
20 under a continued high clamping pressure. This function is ensured as long as the extremely high clamping pressure is maintained. On relief of the extremely high clamping pressure which is applied on the pipe coupling the sealing function is made inactive. This involves, during use, on
25 extreme loads occurring axially though the armature members, in combination with varying extremely high internal medium pressures and/or significant temperature variations in the coupling pieces and the sealing ring, a breakage of the seal arising, with leakages following from
30 this and also the need for repair. The repair which makes

it necessary to scrap the permanently deformed sealing ring, and possible damage, which is imposed on the coupling pieces, is rather time-consuming and rather expensive. This is particularly the case on use in a pipe conduit which is utilised in a drilling operation and/or in connection with transportation of gas/oil products from wells in the ocean.

In NO 303 150 a sealing arrangement is proposed for the afore-mentioned purpose, that is to say for use in a pipe conduit with associated pipe coupling during extreme conditions of use. In the sealing arrangement the afore-mentioned metallic sealing ring is omitted. Instead two armature members (coupling pieces) are employed, which form a direct sealing abutment with each other in a mutual sliding abutment via a conical sealing face of an elastically yielding ring portion of the one armature member. There is employed a conical supporting surface of a robust supporting portion of the other armature member. As a result of the slidable sealing engagement between the armature members, in combination with the elastically yielding sealing portion of the one armature member it is possible to ensure an effective sealing engagement during use of the pipe coupling.

This sealing effect can be achieved, even when extreme axial tensile and pressure forces occur between the armature members and even when significant temperature variations and extreme pressure variations occur in the pressure medium which passes through the pipe coupling.

Normally the sealing arrangement can be reemployed after use, that is to say after the introductory applied clamping force is relieved.

However, also according to NO 303 150, there are employed very high clamping pressures (up towards the yield point of the metallic sealing portion of the coupling) during mounting, that is to say during the joining of the armature members, and also during the use itself of the pipe coupling. This is caused by the relatively rigid and relatively thick-walled sealing portion of the one coupling piece, which is to be subjected to elastic deformation.

By virtue of the different loadings, which occur in the pipe coupling during use, in combination with the slidable seal which is obtained between the armature members, there are employed in the known solution particularly high clamping pressures, that is to say as mentioned clamping pressures of an order of magnitude almost up to the yield point of the metallic material of the armature member having the elastically yielding sealing portion.

In the known solution the clamping pressure, that is to say the applied preliminary pressure, shall during use be able to compensate for occurring tensile forces and relative axial movements following from this between the sealing face and the stop face of the two armature members, at the same as an effective sealing off is ensured between the armature members.

On possibly exceeding the yield point of the material of the armature member/ members, the sealing function

between the armature members fails. The result is that at least the armature member with the elastically yielding sealing portion, must be replaced.

According to the invention the aim is a sealing
5 arrangement, which inter alia can be employed for the same or similar purposes, as according to NO 303 150, and which can replace with advantage said known solution, based on an axially slidable sealing engagement.

According to the invention the aim is to utilise a
10 separate, elastically yielding sealing ring, instead of an elastically yielding sealing portion of the one armature member according to NO 303 150.

In extreme cases the aim is to be able to replace
only the sealing ring, in a manner known per se, on need,
15 instead of having to replace the whole armature member with elastically yielding sealing portion, as is necessary according to NO 303 150.

In addition the aim is to be independent of the
extremely high clamping pressures according to the known
20 solution during mounting of the sealing elements and during use of the pipe coupling. This involves being able to achieve an effective sealing off of a substantially lower clamping pressure region based on an elastic adjustment between sealing abutment and various pressure
25 and tensile loadings which occur axially though the armature members.

A further aim is to be able to employ a substantially
simpler mounting technique according to the invention than
according to the known solution, in combination with said
30 substantially lower clamping pressure against the sealing

ring during use, than that which is a prerequisite according to NO 303 150.

However the solution according to the invention is not limited to such use, as indicated in NO 303 150, but
5 can as mentioned above find application for a series of various other purposes. The sealing arrangement according to the invention can for example find application in areas where there is a need for substantially simpler sealing arrangements than proposed in said patent, but where in
10 addition it is favourable having a slidable sealing engagement between sealing ring and armature members.

The sealing arrangement according to the invention is characterised in that the sealing wings of the sealing ring are elastically deformable, and that the sealing ring
15 during use is supported in a radial direction of the armature members via three axially separate corresponding annular faces facing radially, the sealing wings during use forming both slidable sealing and slidable impact against a respective conical, combined sealing and slide
20 face of each of the armature members, while the stem of the sealing ring during use has a certain degree of fit in an axial direction and is adapted to be supported with a sliding fit against an associated armature member via a middle, combined support and slide face at the outer end
25 of the stem of the T-shape.

By means of the middle support and slide face, which is arranged in a sealing ring stem, which preferably is rigid and shape stable, it is possible during use for the sealing ring to move unhindered relative to each of the
30 armature members, inter alia for equalising of, that is to

say equally distributing of occurring sealing pressures on each of the sealing wings. This is the case even under extreme use conditions (extreme medium pressures in the coupling in combination with extreme loadings on the armature members).

By means of the elastically deformable sealing wings of the sealing ring in combination with said shape-stable and rigid stem, it is possible, by sliding movement of the sealing ring relative to the armature members, to ensure effective sealing off in various axially displaced sealing positions, according to need.

By means of the rigid stem an effective bracing of the middle main portion of the sealing ring can be ensured. By means of relatively slender sealing wings an elastic deformation of the sealing wings can be achieved in a relatively simple manner, even if the sealing ring is made of rather rigid material, such as metal, glass or rigid plastic.

According to the invention it is preferred to produce the sealing ring of the same material as the armature members, for example of metal, such as aluminium, or of a material, which has the same or substantially the same coefficient of thermal expansion as the material of the armature members. By this it is possible to subject the material of the armature members and the material of the sealing ring to similar or as far as possible similar expansion or contraction at varying temperature and pressure conditions.

Further features of the sealing arrangement according to the invention will be evident from the following

description with regards to the accompanying drawings, in which:

Fig. 1 shows a sealing arrangement according to the invention utilised in connection with an armature in the form of a pipe coupling, illustrated partly in side view and partly in longitudinal section.

Fig. 1a shows a section of two armature members in a joined position.

Fig. 2 shows the same as in Fig. 1, illustrated in perspective and partly in side view and partly in longitudinal section.

Fig. 3 shows a first armature member in longitudinal section.

Fig. 4 shows a second armature member in perspective.

Fig. 5 shows a clamping member in longitudinal section

Fig. 5a shows the clamping member according to Fig. 5 in plan view.

Fig. 6 shows a sealing ring, illustrated partly in side view and partly in longitudinal view.

Fig. 7 and 8 show the sealing ring according to Fig. 6 in plan view and in perspective view respectively.

Fig. 9 shows a section of Fig. 6 on a larger scale.

Fig. 10 illustrates the sealing arrangement according to the invention before joining together.

Fig. 11 illustrates the sealing arrangement according to the invention after joining together.

Fig. 12a - 12d show schematically four different stages of an axial clamping together of the armature members, illustrated with a pair of clamping means of the

one armature member and a pair of clamping means of the clamping member of the clamping device.

A sealing arrangement 10 according to the invention comprises, as is shown in Fig. 1, a first armature member
5 11 and a second armature member 12 plus an annular sealing ring 13. In addition a combined clamping and locking device 30 is employed in the sealing arrangement 10, which will be described in more detail further below in the description.

10 The sealing arrangement 10 according to the invention can be employed for different types of armatures, such as pipes, hoses, conduits, containers, cover members, and the like.

In a first embodiment, according to Fig. 1 - 9, the
15 sealing arrangement 10 is shown in connection with an armature, which is in the form of a pipe coupling. Instead of designating the members as " pipe members ", there is employed herein, as mentioned above, the general term 'armature members', in order to stress that other members
20 can be employed instead of the pipe members or coupling pieces illustrated herein.

The sealing arrangement 10 can be utilised for arbitrary sealing purposes, with different requirements for sealing pressures and with different requirements for
25 variations in sealing pressures and different requirements for variations in temperature conditions.

The sealing arrangement 10 is utilisable in principle for sealing off internally for preventing leakage of medium from within and outwards, as well as for external
30 sealing for preventing leakage of medium from outside and

inwards. In the illustrated embodiment however there is only shown a construction for internal sealing.

If desired there can be employed a first, radially inner sealing ring against internal excess pressure and a
5 second, radial outer sealing ring against external excess pressure, each sealing ring being based on the sealing arrangement according to the present invention.

The sealing arrangement 10 can be specifically utilised for equipment which can be exposed to significant
10 variations in internal and external medium pressure and/or significant variations in external and internal temperature conditions. The solution for example shall be able to be utilised under temperature variations of 40 - 50°C or more. In this connection it is considered
15 specifically for use in desert regions with extremely high day temperatures and rather low night temperatures. Furthermore it is considered for use in Arctic or similar cold regions of application, where at certain times of the year there can occur extremely low temperatures.

20 The T-shaped, relatively rigid and relatively shape-stable sealing ring 13 of the sealing arrangement can be made of largely arbitrary, relatively rigid material, such as metal, plastic, glass or the like. Preferably the sealing ring 13 is made of the same material as the
25 armature members 11,12 or of a material having a similar or largely corresponding coefficient of heat expansion.

The said four members 11,12,13,30 have a common longitudinal axis 10a. Three members 11 - 13 each have their mutually flush, cylindrical inner faces 11a, 12a,
30 13a. The locking device 30 is arranged radially just

outside the armature members 11,12 in a region where these overlap each other.

The sealing ring 13 is, as shown in Fig. 1 in a condition ready for use, received in a downwardly opening layer 11b (see Fig. 1a) of the one armature member 11. The layer 11b is defined between a first, radially extending, axially facing, innermost guide face 19 and a second, radially extending, axially facing, outermost guide surface 20 and an intermediate, stop-forming conical face 21 plus a radially facing cylindrical, outermost lying support face 22. The conical face 21 passes at a cone angle α relative to the longitudinal axis 10a of the sealing arrangement 10.

The armature member 12 is, as shown in Fig. 1a, provided with an upwardly opening layer 12b, which comprises a first, radially extending, axially facing, innermost guide surface 23 and a second, radially extending, axially facing outermost guide surface 24 and an intermediate, stop-forming cone face 25, which extends equivalently at a cone angle α relative to the longitudinal axis 10a.

As shown in Fig. 1 and 1a the armature member 11 has a skirt portion 26, which overlaps a peripheral portion 27 of the armature member 12 in a region axially within end face 23 of the armature member 12.

The armature members 11 and 12 are provided with two pairs of equivalent cylindrical guide faces 26a, 27a and 26b, 27b having mutually adapted degrees of fit. The armature members 11,12 form mutually supporting abutments via conical stop faces 26c, 27c of a transition portion

between the pairs of the guide faces 26a, 27a; 26b, 27b. In the pushed together condition the armature members 11,12 are closed off having mutual support in the axial direction via the stop faces 26c, 27c. After mounting by
5 means of the clamping device 30 the armature members 11,12 are closed off in the opposite axial direction.

In Fig. 1 and 2 the clamping device 30 of the sealing arrangement 10 is shown designed with a sleeve-shaped clamping member 31, which is rotatably mounted via a
10 collar portion 32, which projects inwardly into an annular groove 33 on the armature member 11. The annular groove 33 is defined between a shoulder portion 34 on the armature member 11 and a two-piece, stop-forming ring 35, which is locally fastened to the armature member 11 via radially
15 extending fastening means 36.

In the use position of the sealing arrangement the end face 31a of the clamping member 31 is closed tightly up to an axially facing side face 37a of a two-part, stop-forming ring 37, which is locally fastened to the second
20 armature member 12 in an associated annular groove 38 via radially extending fastening means (not shown further).

Along the lower outer side of the clamping member 31 there is fastened a cover member 39 via radially extending fastening means 40. By means of the cover member 39 a gap
25 41 can be sealed off between the clamping member 31 and the ring 37. Along the upper outer side of the clamping member 31 there is fastened to the clamping member 31 a sleeve-shaped hand grip portion 42 having projections 43 projecting radially outwards.

On the inner side (see Fig. 5) of the clamping member 31 there are arranged lowermost a series (four shown herein) of clamping means 44 projecting radially inwards, which are mutually separated by a corresponding number
5 (four) of intermediate spaces 45.

On the outer side (see Fig. 4) of the armature member 12 there project radially outwards a series (four) of mutually separated clamping means 46, which are mutually separated by (four) intermediate spaces 47.

10 In the illustrated embodiment the clamping means 44 are provided with an axially facing, radially extending, elongate and plane clamping face 48.

The clamping means 46 are provided on their corresponding, axially facing clamping faces with an
15 corresponding axially facing, radially extending, elongate and plane clamping face. In practice and as is shown in Fig. 12a - 12d the last-mentioned clamping face comprises a relatively short, radially extending wedge surface 49 and a following, considerably longer, radially extending
20 support surface 50.

In sealing rings of steel, aluminium or other metal preferably mechanical clamping devices (not shown further) are employed in connection with the axial clamping together of the armature members 11,12, while in addition
25 the clamping device 30 is employed in order to rotate the clamping means 44,46 (see Fig. 12a - 12d) into place in mutual locking positions (Fig. 12d).

In another case, where for example sealing rings of plastic are used, the clamping device 30 can be employed
30 both for axial clamping together of the armature members

11,12 and for locking together of the clamping means 44,46. In the last-mentioned case the wedge face 49 is employed in connection with the clamping together of the armature members 11,12.

5 In an introductory phase of the coupling together of the armature members 11,12 (see Fig. 12a) the clamping member 31 is rotated relative to the armature members 11,12 about the axis 10a, so that its clamping means 44 can be pushed axially inwards into the intermediate spaces
10 47 between the clamping means 46 of the armature member 12.

Thereafter the armature member 12 is pushed axially inwards into the armature member 11 and its clamping member 31, as is indicated by an arrow A in Fig. 12b.

15 The clamping member 31 is thereafter turned, as is shown by the arrow B in Fig. 12c, to the position which is shown in Fig. 12d. By means of the wedge face 49 the armature members 11,12 are forced axially together from a position as shown correspondingly in Fig. 10 to a position
20 as shown in Fig. 11.

In the last mentioned position the clamping means 46 of the armature member 12 and clamping means 44 of the clamping member 31 are secured in a mutual locking engagement via the plane clamping faces 48,50. At the same
25 time the armature members 11,12 impact axially together via the stop faces 26c, 27c.

The members 11,12,31 are hereby secured axially in place relative to each other, while there is defined a degree of fit or other adjusted spacing between respective

side faces 14b, 14c of the stem 14 and opposite guide faces 20,23 of the armature members 11,12.

There is hereby ensured an adjustment of the position of the stem 14 relative to the layer 11b and the layer 12b in an axial direction, while the sealing faces 15a and 16a are centered correspondingly in place in an axial direction relative to the conical support faces 21,25 of the armature members 11,12.

In the illustrated embodiment the sealing ring 13 forms a direct abutment only against the conical support face 21 of the armature member 11 and against the conical support face 25 of the armature member 12. The sealing ring 13 has a degree of fit or a larger or smaller spacing from opposite faces 19,20,22 of the layer 11b of the armature member 11 and from the guide face 23 of the layer 12b of the armature member 12.

The sealing ring 13, as shown separately in Fig. 6 - 9, has a substantially T - shaped cross-section with a middle stem 14 and two side wings 15,16. The side wings 15,16 are mutually connected via the middle stem 14 of the sealing ring in and at the inner face 13a.

The stem 14 is provided opposite the inner face 13a, with a cylindrical peripheral face/end face 14a. The end face 14a is adapted to form a slidable support surface for the sealing ring 13 along its periphery via the support face 22 of the armature member 11.

In the illustrated embodiment the cylindrical end face 14a of the sealing ring is provided with a central annular groove 17, which is designed to receive an elastically yielding O - ring 18, which projects radially

just outside the end face 14a. The O - ring 18 can be utilised as the slide member of the sealing ring 13 during mounting in the armature and particularly for retaining the sealing ring 13 in a partially pushed in position, especially on mounting of the sealing ring 13 from below and upwardly into the downwardly opening layer 11b of the armature member 11.

The stem 14, which has a largely rectangular, rigid and compact cross-section, has from each respective end edge of the cylindrical end face 14a a radially extending, axially facing side face 14b and 14c respectively. In practice the side face 14b is arranged at a certain distance from the opposite guide face 20 of the armature member 11. Correspondingly the side face 14b is arranged at a certain distance from its opposite guide face 24. The distance between each side face/guide face pair can be minimal, that is to say in the degree of fit order of magnitude or at a certain distance, for example 1 - 3 mm in sealing rings having a relatively large diameter.

From one side face 14b of the stem 14 there projects laterally outwards a first sealing face in the form of a conical face 15a of the one side wing 15. From the other side face 14c there projects laterally outwards in the opposite direction a second sealing face in the form of a conical face 16a of the other side wing 16. The sealing forming conical faces 15a and 16a of the sealing ring 13 have equivalent dimensions and are designed symmetrically relative to the stem 14.

In the illustrated embodiment sealing faces 15a, 16a of the sealing ring 13 can have the same or substantially

the same cone angle α as the respective opposite support faces 21,25 of the armature members 11,12. In such a case effective sealing is achieved by moderate axial displacement of the sealing wings 15,16 of the sealing ring 13 along support faces 21,25 of the armature members 11,12 during exertion of a significant radial sealing pressure against the support faces 21,25.

The sealing wings 15,16 are provided with their respective radially extending, axially facing end face 15b, 16b. There are shown (see Fig. 11) end faces 15b, 16b of the side wings 15,16 at a certain axial distance from the guide faces 19 and 23, so that the sealing wings 15,16 can be moved along the conical faces 21,25 axially a certain distance backwards and forwards relative to the faces 19 and 23 during expansion/contraction possibly occurring of the material of the sealing ring 13.

Furthermore in the illustrated embodiment the sealing ring 13 is provided, in diametrically opposite portions of the stem 14, with two axial through bores 17a, 17b including screw threads. The bores 17a, 17b are adapted to be passed through by a spindle having screw threads equivalent to the screw threads of the bores 17a, 17b in order to be able to force the stem 14 of the sealing ring axially away from the adjacent support face of the armature member on dismantling of the sealing ring after use, in the cases where the end face 14a on the stem 14 of the sealing ring 13 exhibits too great a friction against the cylindrical support face 21 of the armature member 11.

According to an alternative embodiment (see Fig. 10 and 11), which can be employed for simple sealing arrange-

ments, but which is preferred in sealing arrangements which are to be employed under high sealing pressures or under other particularly demanding sealing conditions, a sealing ring 13' has a cone angle b which is somewhat
5 larger than the cone angle a of the armature members 11,12.

The pushing together of the armature members 11,12 around the intermediate sealing ring 13' can in this instance take place in a corresponding manner as in the
10 case which is described above. In Fig. 10 the sealing ring 13' is shown in an introductory phase of the pushing together between the armature members 11, 12 and in Fig. 11 the same is shown after ending the pushing together. The gaps between faces 14b, 14c of the sealing ring 13' and opposite faces 20,23 of the armature members 11,12 are
15 shown according to Fig. 11 relatively large, but can in practice be considerably narrower, for example of a degree of fit order of magnitude.

In the illustrated embodiment the sealing ring forms,
20 on the one side of the stem, a sealing abutment via the conical sealing face 15a of the sealing wing 15 against cone face 21 of the armature member 11, while the sealing ring 13, on the opposite side of the stem 14, forms a sealing abutment via conical sealing face 16a of the
25 sealing wing 16 against the cone face 25 of the armature member 12.

In certain cases with simple sealing arrangements, the faces 14a, 14b and 15b, 16b of the sealing ring 13 can form direct support abutments against opposite faces
30 19,20,22 and 23,24 of the armature members 11,12.

In remaining cases, especially when the question is about sealing arrangements requiring more adjustment, the faces 14a, 14b, 15b and 14c and 16b of the sealing ring 13 can be arranged at a greater or smaller distance from said
5 faces 19,20,22 and 23,24, according to need. This case is indicated for example in the second embodiment according to Fig. 10 and 11.

According to Fig. 10 and 11 a sealing arrangement 10' according to the invention is shown having a sealing
10 ring 13' according to an alternative construction.

A first departure from the first construction, which is illustrated according to Fig. 1 - 9, consists in that prior to mounting the conical sealing faces 15a' and 16a' form a cone angle b , which differs from the cone angle a
15 of the conical support faces 21,25.

In that the cone faces 15a, 16a at the starting point, that is to say prior to mounting, form a cone angle b , which is somewhat larger than the equivalent cone angle a of the armature members 11,12, the sealing wings 15 and
20 16 can during mounting be deformed elastically relative to the conical support faces 21,25, so that the sealing faces 15a, 16a coincide with equivalent conical support faces 21,25 of the armature members 11,12 at a common cone angle a .

25 During installation of the sealing ring 13' in the armature member 12 the sealing face 15a forms in a first installation phase a minimal abutment against the cone face 25, while adjacent side face 14b of the stem 14 forms a significant space from the opposite face 20 of the
30 armature member 12.

On pushing together the armature member 11 against the armature member 12 about the intermediate sealing ring 13, by means of the clamping device 30, from the position which is shown in Fig. 10 to the position which is shown in Fig. 11, the sealing wings 15',16' of the sealing ring 13' are deformed in an elastically yielding manner against the conical cone faces 21,25 until the sealing faces 15a', 16a' form a tight abutment against the cone faces 21,25. In a position corresponding to that which is shown in Fig. 1, the conical sealing faces 15a, 16a form the same cone angle α as the cone faces 21,25 of the armature members 11,12, as is shown in Fig. 11.

By arranging for a certain degree of fit between end face 14a of the sealing ring 13' and support face 22 of the armature member 11 one can ensure that the stem 14 of the sealing ring can make a certain axial adjustment if necessary and be centered in place in a middle position between the armature members 11,12, as is illustrated in Fig. 11. In this connection, without this being specifically illustrated in the drawing, larger or smaller spaces can be employed between the faces 14b,22 and between the faces 14c,24, according to need.

In the construction according to Fig. 10 and 11 provision is made, as an extra, alternative possibility, for a respective portion of the sealing face 13a' of the sealing wings 15',16' to have prior to mounting a conical outline at a cone angle b , so that said portions of the sealing face 13a' receive after mounting, that is to say after the sealing wings 15',16' are elastically deformed

relative to the support faces 21,25 a flush outline with the guide surfaces 11a, 12a of the armature members 11,12.

In the construction according to Fig. 10 and 11 an endwise support abutment is employed between the armature
5 members 11,12 via radially extending support faces 20',25' instead of the support abutment between the cone faces 26c, 27c of the first embodiment.

Patent Claims

1. Sealing arrangement (10,10') comprising two armature members, which are adapted to receive a sealing ring (13,13') between them for sealing off a joint between the armature members (11,12), and a clamping device (30), which during mounting is adapted to clamp the armature members (11,12) against each other in a direction towards the intermediate sealing ring (13,13'), where the sealing ring (13,13') has a substantially T-shaped annular cross-section, with a stem (14) extending radially outwards and with a sealing face (15a, 15b) facing radially outwards in each of two sealing wings (15,16) projecting axially outwards in opposite directions from stem (14) of the T-shape, the sealing wings (15,16) having mutually equivalent forms and equivalent conical sealing faces (15a, 16a) for forming abutments against their respective conical support faces (21,25) of each of the armature members (11,12), characterised in that

the sealing wings (15,16) of the sealing ring (13,13') are elastically deformable, and

that during use the sealing ring (13,13') is supported in a radial direction in the armature members (11,12) via three axial separated, annular faces (21,22,25) facing radially correspondingly,

the sealing wings (15,16) forming during use both slidable sealing and slidable thrust against a respective conical, combined sealing and slide face (21,25) of each of the armature members (11,12),

while the stem (14) of the sealing ring (13,13') has during use a certain degree of fit in axial direction and is adapted to be supported with a sliding fit against an associated armature member via a middle, combined support and slide face (22) at the outer end of stem (14) of the T - shape.

2. Coupling in accordance with claim 1, characterised in that the middle support face (22) is arranged in the one armature member (11), and

10 that the two remaining support faces (21,25) are arranged each in their respective armature member (11,12).

3. Coupling in accordance with claim 1 or 2, characterised in that

15 the conical support faces of the armature members (11,12) have a first, smallest cone angle (a), and

that the conical sealing faces (15a, 16a) of the sealing wings (15,16) have, prior to mounting, a second, somewhat larger cone angle (b) and after mounting have the same cone angle (a) as the conical support faces (21,25),
20 and

that the sealing faces (15a, 16a) of the sealing wings (15,16) ensure sealing between the sealing ring (13,13') and the armature members (11,12) during use during a possible relative movement axially along
25 respective conical support faces (21,25) of the armature members (11,12) over a length of movement of between 0.5 and 2.5 mm or over a length of about 30% of the length of the conical support face (21,25).

4. Coupling in accordance with one of the claims 1 -
30 3, characterised in that

the armature members (11,12) form, during use, mutual support via mutually opposite, stop - forming cone faces (26c, 27c), and

that stem (14) of the sealing ring (13,13') is closed off, correspondingly during use, with a moderate degree of fit between the armature members (11,12), in order to permit a certain moderate movement of the sealing ring (13,13') in an axial direction relative to the armature members (11,12).

5. Coupling in accordance with one of the claims 1 - 4, characterised in that

stem (14) of the sealing ring (13,13') has a relatively large cross-section and large rigidity,

and that the two sealing wings (15,16) of the sealing ring (13,13') have a relatively smaller cross-section and smaller rigidity.

6. Coupling in accordance with one of the claims 1 - 5, characterised in that

the sealing ring (13,13') is made of the same material as the armature members (11,12), for example of metal, such as aluminium, or is made of a material, which has the same or substantially the same coefficient of heat expansion as the material of the armature members (11,12).

FIG. 1

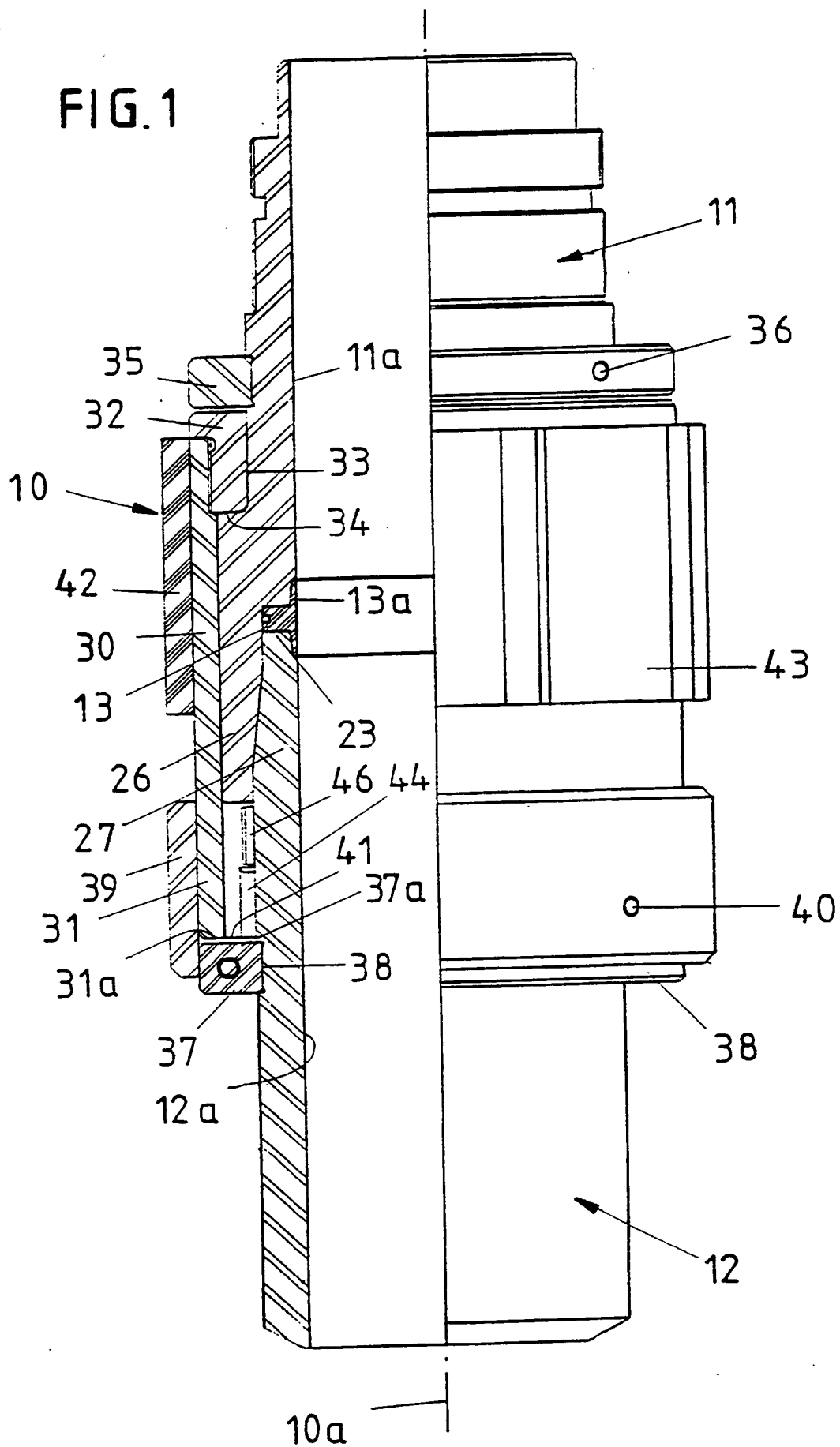


FIG. 1a

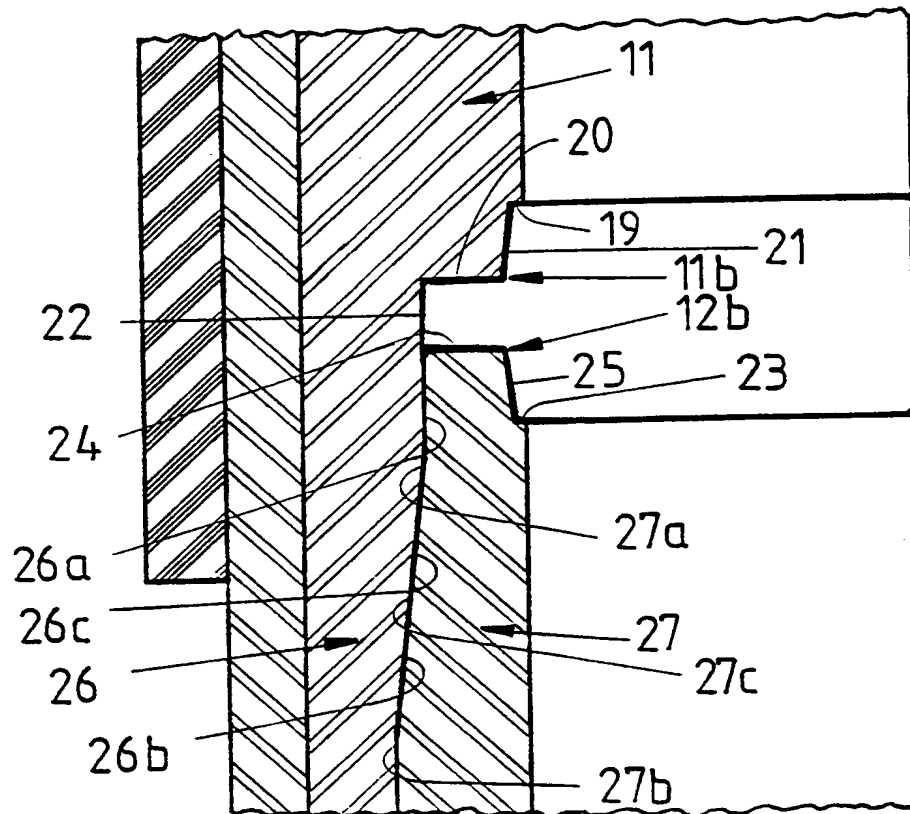


FIG. 2

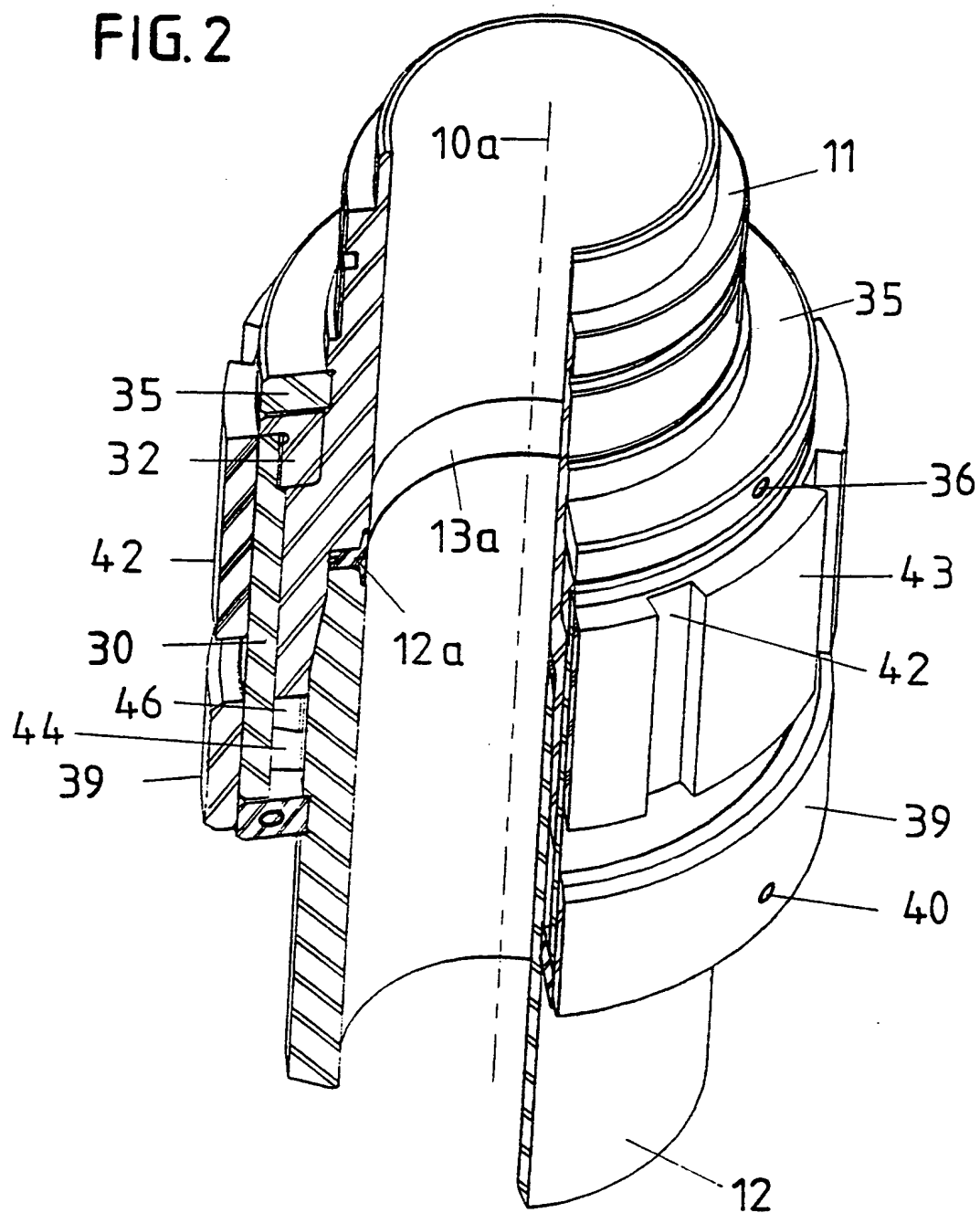


FIG.3

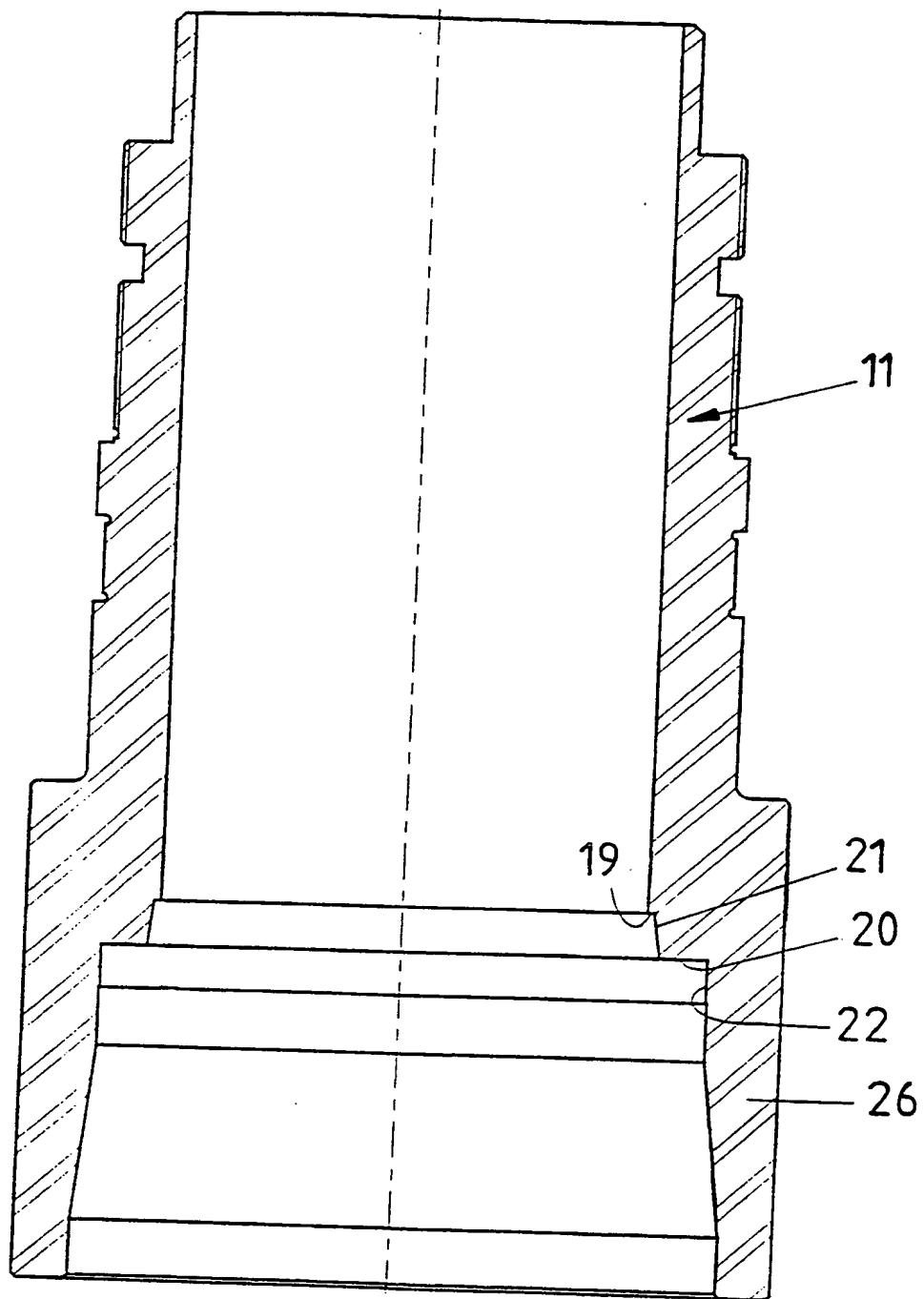


FIG. 4

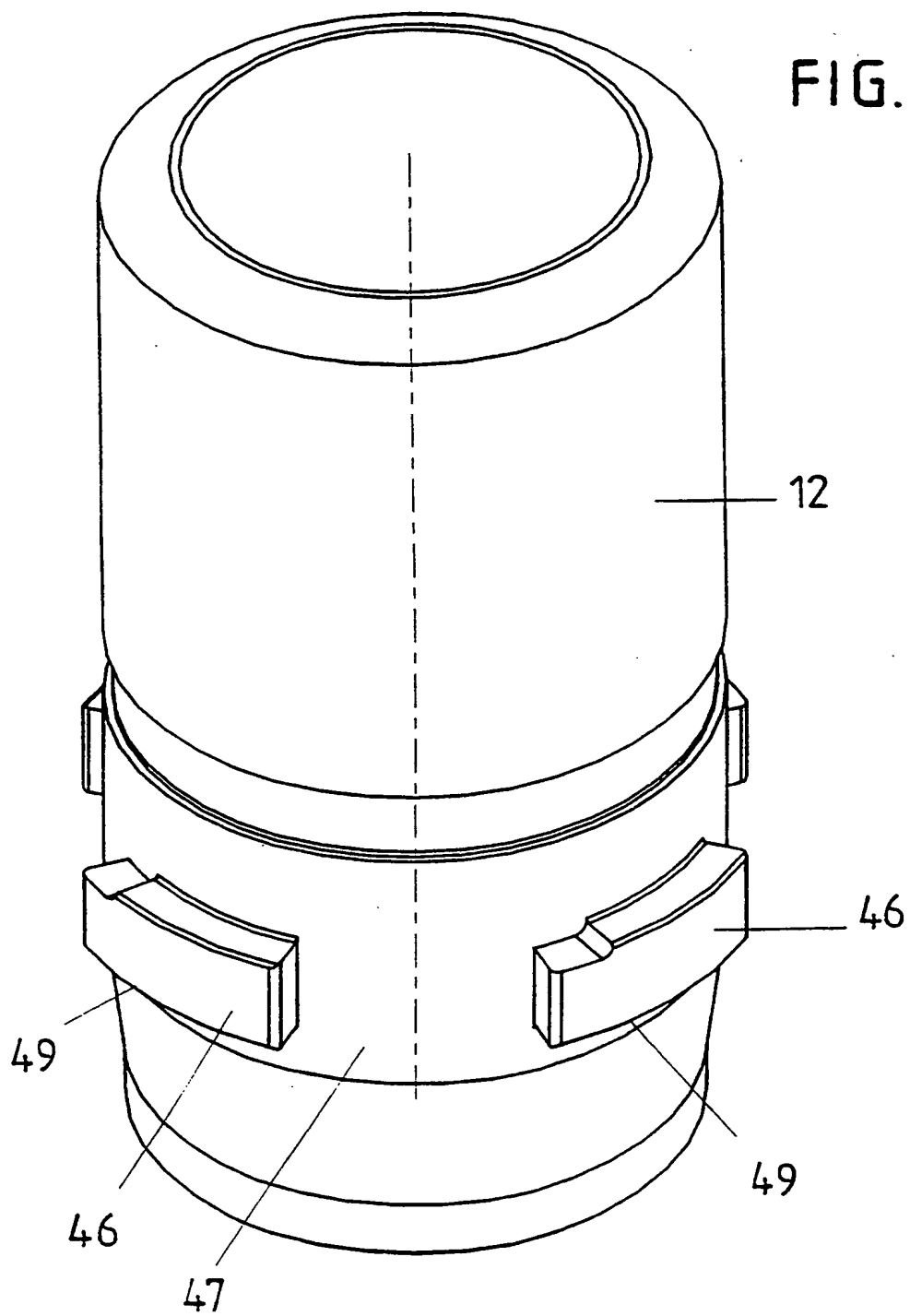


FIG. 5

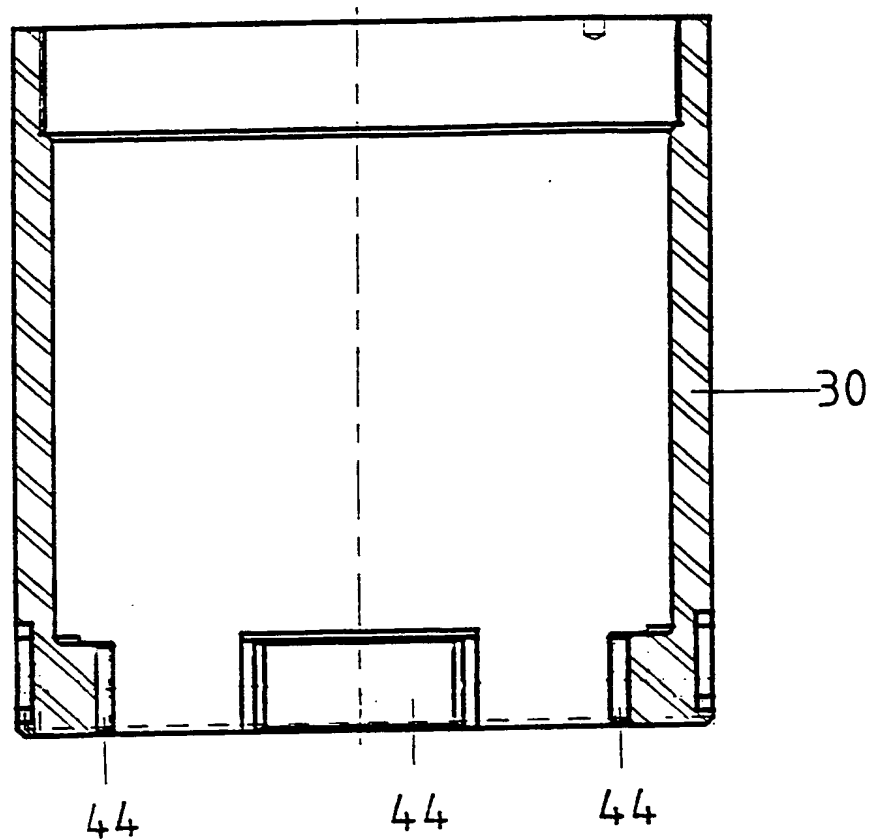


FIG. 5a

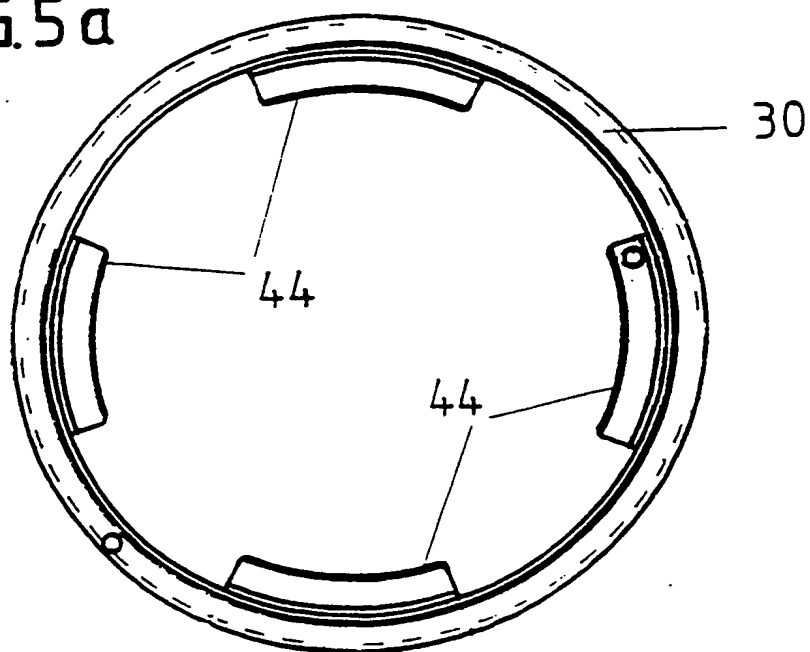


FIG. 6

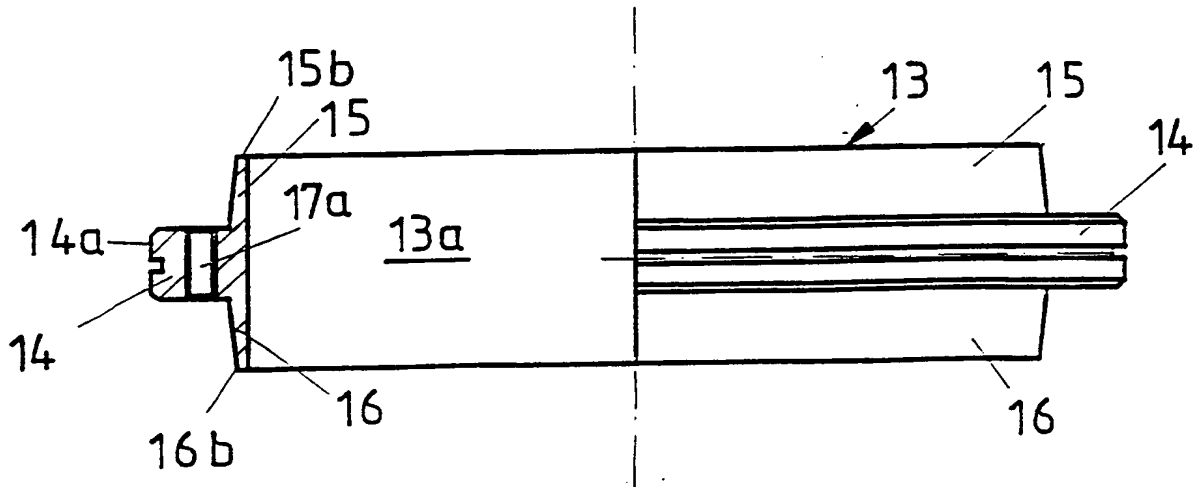


FIG. 7

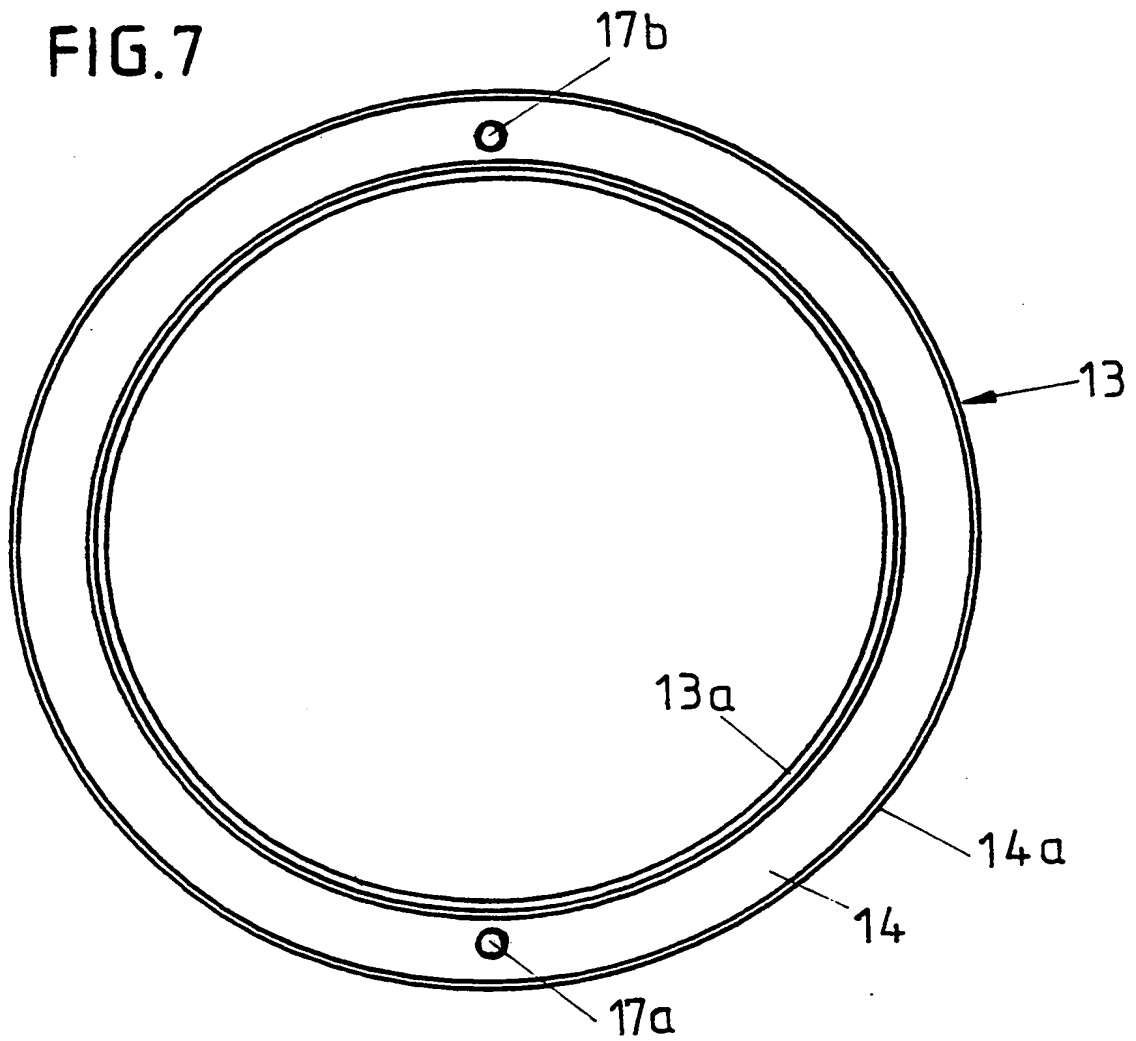


FIG. 8

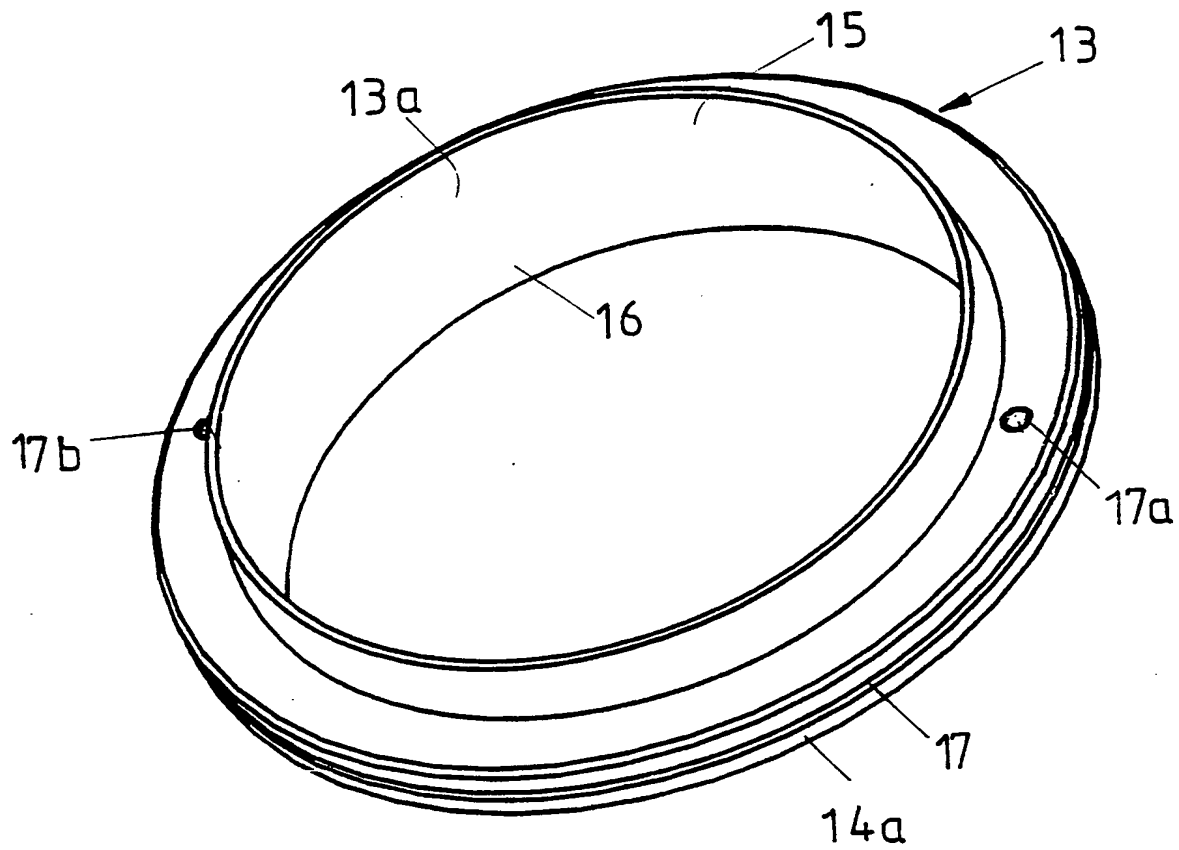
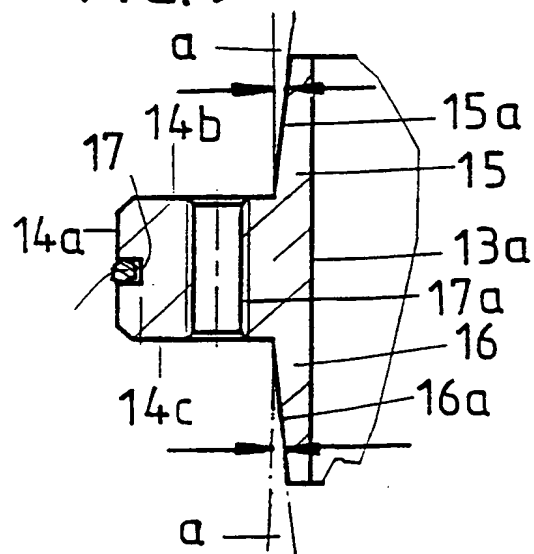
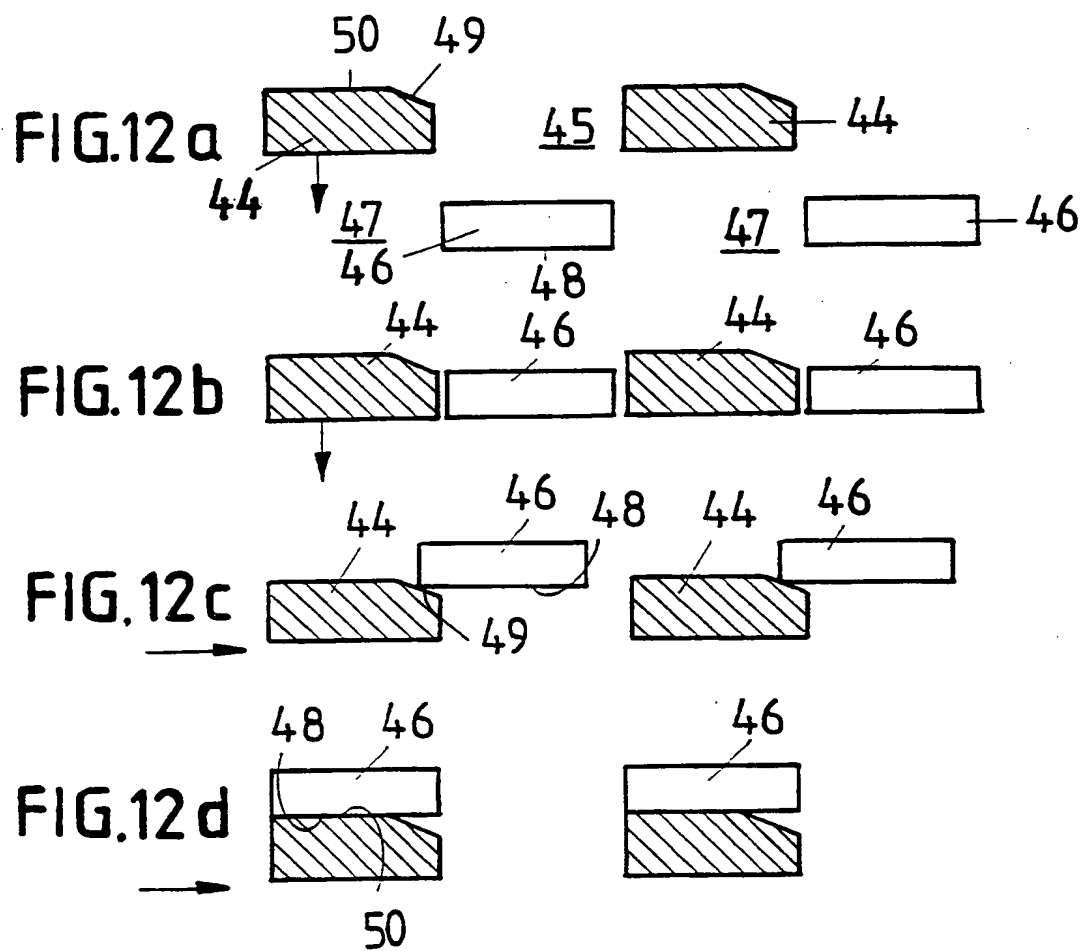


FIG. 9



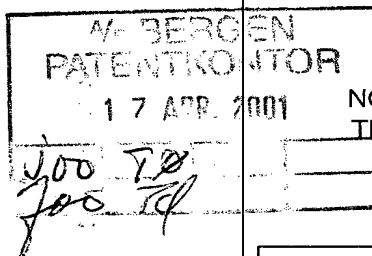


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Applicant

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1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

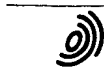
4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

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